SCIENTIFIC AMERICAN

THE PHONOGRAPH LEAVES THE AIR-SCOUT'S HANDS UNHAMPERED.—[See page 175.]

Vol. CXII. No. 8
February 20, 1915

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An Undefended Treasure Land

Do you know that the United States is the richest country in the world, with a wealth in lands, farms, factories, cities, railroads, etc., combined, nearly twice as great as that of the second richest country on the list?

Do you know that this, the richest country, is practically helpless against invasion and conquest?

Do you know that our much-talked-of coast defenses protect merely our harbors, and do not, and were never intended to defend our coasts?

Do you know that any one of the great military powers of Europe which possesses a navy more powerful than ours, in ten days after the declaration of a premeditated war, could land an army of 200,000 veteran soldiers, complete with artillery, motor cars, stores, etc., on our coasts at points remote from the harbor fortifications?

Do you know that this army, landing at designated points near Boston, New York, Philadelphia and Washington, would in twenty days time be able to capture from the land side the forts protecting these cities, and clear out the mines from the channels?

Do you know that the enemy's dreadnoughts could then enter the harbors, anchor within range, and secure five billion dollars indemnity in lieu of having these cities utterly laid waste by bombardment?

Do you know that while the enemy was thus securing the prepayment of the cost of the war, his transports would be landing other troops for the seizure of the inland cities and great manufacturing centers of the country?

Do you know that while this was being done to us, we would be powerless to resist, our continental 30,000 regular troops and 60,000 militia being scattered from Maine to California and from Canada to the Gulf?

Do you know that it would take 30 days to gather these forces on the Atlantic coast, and that when they reached there, they would be short of artillery and supplies, and for lack of experience in maneuvers, would be helpless in the presence of the veteran troops and Generals of Europe?

Do you know that when this little army had heroically dashed itself to pieces against superior forces, the country would have no reserves whatever to carry on the war?

Do you know that if a million volunteers rushed to arms—as they would—there would be no arms for them; and do you realize that a million unarmed and untrained men would be but a mob?

If you want to know the absolute truth about these amazing conditions

Read the Series of Articles

on "The U. S. an Undefended Treasure Land," which is now running in the Scientific American

SEVENTY-FIRST YEAR

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THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

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New York's Greatest Lighting Spectacle

By Charles W. Person

WHEN the sixty-storied Woolworth structure was nearing completion, Cass Gilbert, who was employed to prepare the architect's drawings, went to F. W. Woolworth's office with a big roll of plans in his arms.

"How high do you want the tower now?" asked Mr. Gilbert.

"How high can you make it?" questioned Mr. Woolworth.

"It is for you to make the limit," said Mr. Gilbert.

Mr. Woolworth was silent. The Metropolitan tower had just been run into the air, overtopping the Singer building. At that particular moment he had on his desk the exact measurements of the Metropolitan tower. Studying these figures a moment, he turned to Mr. Gilbert.

"Then make it at least fifty feet higher than the Metropolitan tower," said he.

That is one chapter in the interesting story explaining how the Woolworth building came to be day king of New York's skyline. That was a distinction of no little importance, but sad to relate, it was short-lived, for with the coming night the huge structure was swallowed up in darkness and robbed of its glory. To the south appeared the real night king of the skyline—a lesser king, to be sure, but none the less real—in the form of the Singer tower, strung and studded with lights. The eyes that admired the Woolworth tower by day left it to admire the Singer tower by night.

Thus it was that New York's skyline paid homage to two kings, that is, until New Year's night, when the day king burst from the black night a great crystal of flaming light, causing all the other lighting spectacles of the metropolis to fade away before it. The thirty stories, comprising the tower of the Woolworth building, form the most wonderful permanent lighting spectacle in the world at the present time.

Illuminating building exteriors is not a new feat to New Yorkers. In the past structures have been illuminated by bringing into prominence certain lines and architectural details, obliterating in large measure the other surfaces. Lighting of this character had been installed in connection with the safe and sane Fourth of July celebration, but the results did not best befit the beauty and dignity of the Woolworth building. Mr. F. W. Woolworth, before giving orders for the installation, had his eyes on the Singer tower, just as he had his eyes on the Metropolitan tower before he told Mr. Gilbert to go ahead with the building plans. It was his desire to engineer a lighting spectacle that would not only be original, but gigantic.

A string of incandescent bulbs or a series of strings was out of the question, so it was decided at the start to light the entire surfaces of four sides of the tower from the thirtieth to the sixtieth floor and make the installation a permanent one. It took 50,000 feet of conduit from ½ to 3 inches in diameter, 16,400 feet of 500,000 C. M. cable, and 50,000 feet of No. 14 duplex wire to complete the installation.

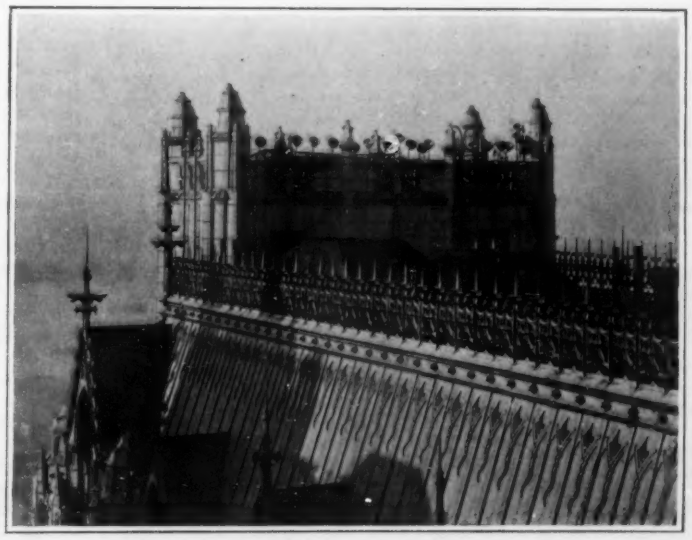
On account of the great height and to insure uniform lighting, projectors—ordinary automobile lamps of the largest size—were used. It required six hundred of these projectors, each with a 250-watt lamp of the new gas-filled type with closely concentrated filament, to play light upon the four sides of the thirty-storied tower. In addition to these six hundred projectors twenty-four 1,000-watt lamps were placed in the topmost point of the tower, called the lantern or crow's nest, to give the effect of a great scintillating jewel. The total power consumed is 175 kilowatts—more light than is usually employed in lighting the streets of a city of 30,000 inhabitants.

The projectors are arranged in batteries at vantage points, and so placed that the rays from one set shoot upward along the sides of the tower, and the spaces not touched by this set are played upon by another set arranged on the floors above which direct their rays downward. Thus there is one continual diffusion of light. To prevent anyone in the street from determining the sources of the light, screens are used.

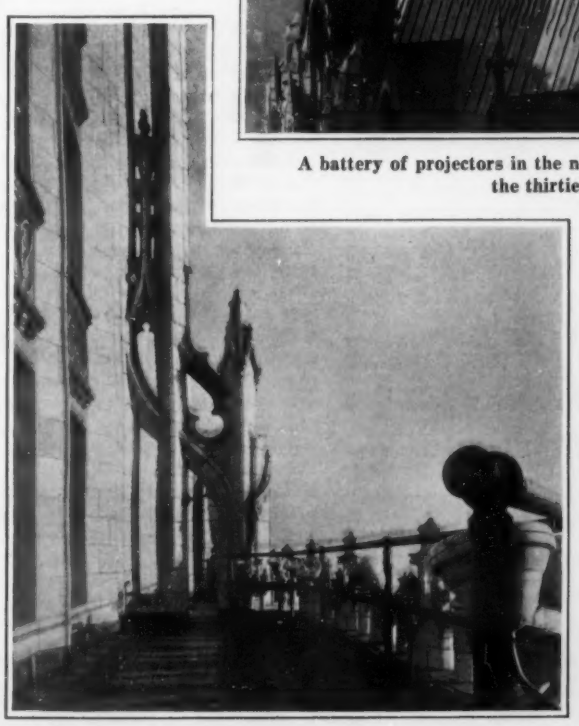
The projectors are distributed in the following manner: Two sets are placed on the north and south wings of the pent houses at the thirtieth floor to light the west side of the tower as far as the forty-third floor. The north and south sides of the tower are bathed in light from the thirtieth to the forty-third floor by a set placed on the gabled roofs at the thirtieth floor. The east side had to be lighted from a set placed on a narrow balcony opposite the twenty-seventh floor. This is the method employed to shoot light upward, so at the forty-third floor a similar set of projectors is placed which plays light on any spots not touched by the projectors at the thirtieth floor.

From the forty-third and forty-ninth floors projectors are focused up as far as the fifty-third floor, or beginning of the Mansard roof. Another set is placed at this floor to illuminate the Mansard roof. Opposite the fifty-fourth floor four sets are placed which play upon the observation balcony at the fifty-eighth floor, or 750 feet above the pavement. But the most novel feature of the whole installation is two stories above—the sixtieth floor—which is the crow's nest or lantern. It is inclosed with diffusing glass and within the lantern itself, which is a very small affair, and is a mere 792 feet 1 inch above Broadway, are placed the twenty powerful lamps. Connected with these lamps is an automatic dimmer, which continually alters their intensity in an irregular cycle. The glass surface of the lantern gives the jeweled effect of a deep red glow no brighter than the adjacent gilded structure, and again it flares to a bright white light of fifty times this intensity.

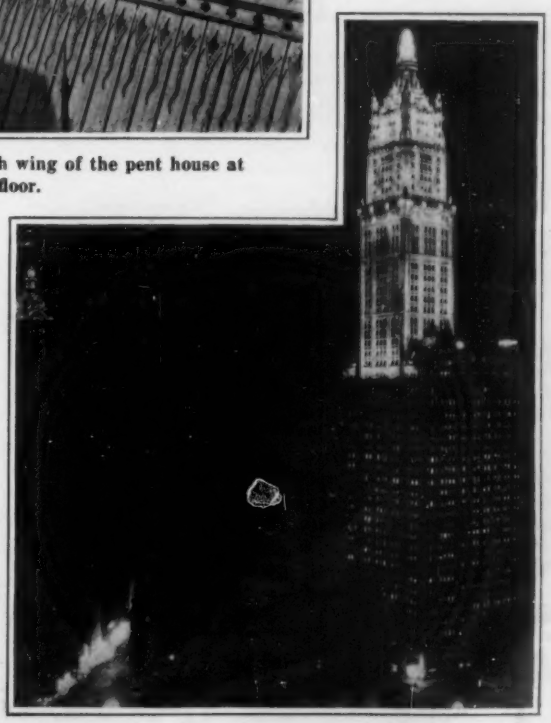
Forty engineers and a dozen electrical experts worked for months making the installation bring out in architectural detail the hidden recesses, the balconies, pent houses, Mansard roof, observation balcony, and lantern. The reflecting characteristics of the glazed terra cotta surface of the building and the necessity for mounting the large amount of material equipment in a few restricted locations of the tower itself caused unusual difficulties in the design of the lighting scheme.



A battery of projectors in the north wing of the pent house at the thirtieth floor.



Projectors on the twenty-seventh floor that throw light to the forty-third story.



The Woolworth tower as it appears at night. The Singer tower is shown at the left.

First Award of the Anthony N. Brady Safety Medal.—Early last year the family authorized the annual award by the American Museum of Safety of a gold medal to the American electric railway company which for the year had done the most to conserve the safety and health of the public and its employees, and the first of these medals has just been awarded to the Boston Elevated Railway Company. Besides the principal medal two replicas, one in silver and one in bronze, are also given respectively to the member of the operating staff and to the employee who contributed most to the successful record of the company. These medals were given to Russell Adams Sears, vice-president of the road, and to Henry V. Neal, a mechanic in the shops, who had served on the Safet Committee, and whose system in the shops had reduced the record of accidents by 19.6 per cent during the year. This is the only case where a workman in an establishment has received such a recognition. It should encourage the men to work out safety methods.

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp* the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The Administration View of the Shipping Bill

THE attitude of the SCIENTIFIC AMERICAN to the Ship Purchase Bill (a measure which has thrown Congress into a deadlock as remarkable as any that has ever occurred) must, by this time, be perfectly clear to its readers. Our opposition to the bill is the outcome of many years of study of the problem of our merchant marine, and it is based upon a serious conviction that the Administration measure does violence to certain fundamental economic and political principles, the violation of which is certain to doom this or any other specious and ephemeral enterprise of the kind to disastrous failure.

At the same time we realize that it will greatly assist our readers in arriving at a more just conclusion as to the merits of the bill, if both sides of the controversy are laid before them clearly and, as far as possible, without prejudice. The arguments of the opposition to the measure we have endeavored to make clear in the series of articles which have appeared in our columns during the discussion of the bill.

It now gives us great pleasure to present elsewhere in this issue an article written at our request by Representative Joshua W. Alexander, Chairman of the House Committee on Merchant Marine and Fisheries, who introduced the Ship Purchase Bill in the House. The article has all the force, logical sequence, and clarity of statement, which one would expect from Judge Alexander in the summing up of an important case. No one can read his statement without being possessed of a perfectly clear understanding of the motives, underlying principles, scope and purpose of this measure. We now can follow, intelligently, the sequence of external events and internal mental processes which led the Administration, after a survey of the conditions existing in our merchant marine and our oversea commerce, to present this measure as the very best which it can offer as a solution of the present difficulties.

The demands of editorial courtesy prohibit us from making any detailed criticism of Judge Alexander's article, at least at the present time. In the following issue of the SCIENTIFIC AMERICAN, however, we hope to publish an article by one of the leading opponents of the bill, and at that time we shall make a detailed comparison of the arguments as set forth by the two great parties to the struggle which is now being waged in Congress.

"An Undefended Treasure Land"

THE series of articles on our military unpreparedness which is now running in the SCIENTIFIC AMERICAN is a plea for an adequate National Police to protect the lives and property of the citizens of the United States, and render conditions so secure that they can live their daily lives and work out their national ideas in peace and quiet. New York city has a municipal police force of about ten thousand—a body of professional men specially trained for their work of preserving the peace and protecting the lives and property of the citizens. At the present time the whole of the United States possesses a national police force of only 30,000 professional soldiers.

Now, the 10,000 men of the New York police force are always within easy call of one another and of headquarters, and in the event of violence on the part of the criminal element of the population, or of a riot by collective bodies of men, they are in a position instantly to master the situation and restore order. The 30,000 regulars of the United States Army, which constitute our national police force, are scattered throughout the length and breadth of our vast country, and in the event of sudden attack by some nation prompted either by ambition for conquest or by fancied grievances, it would take a month or more to concentrate this little force in any number for concerted action against the enemy.

In addition to the 30,000 men of our national police force, we have a special police force, our militia, also widely scattered, of 60,000 effectives, which may be said to answer roughly to the special constables, deputies, etc., which in small towns or communities are sworn in to assist the regular police force, when a disturbance is larger than they can handle. Now, if 10,000 men are needed to protect 5,000,000 people against sporadic and unrelated attempts at violence, by what process of reasoning has this country come to the conclusion that 30,000 regular police and 60,000 special citizen constables are sufficient to protect the 100,000,000 people of this country against the concerted, highly intelligent, and thoroughly prepared acts of violence of some foreign power?

The only possible excuse for not providing a national police in the form of an adequate regular army and militia would be the absolute certainty that no foreign power could possibly have any cause of quarrel with the United States which would lead that country to carry the war into our territory. But on what earthly grounds can we lay claim to such immunity? Is it not a fact that at this very moment our Government is trying (or rather is supposed to be trying) to steer the ship of state on the very edge of the maelstrom of war, without being drawn into its vortex? Again, to predict that this great war will be the last war, that it is merely a tragic prologue to an eternal peace; to shut one's eyes entirely to things as they are, and to indulge in mere Utopian dreaming—such an attitude would presuppose the creation of a new world inhabited by a totally different race.

Now what this country needs, and what its highest military advisers recommend, is that we shall provide a well equipped army, of regulars and militia, of sufficient size to act as a national police force. Just that, and nothing more, is called for in the various reports of the General Staff and in the recommendations of the bureau officials of the War Department.

The series of articles running under the caption "An Undefended Treasure Land" contains the absolute facts concerning the present all but defenseless condition of the United States. These facts have been obtained from the highest officials of the War Department. Every one of them is true; in no single instance has there been the slightest exaggeration. We commend this series to the careful reading of the public, and especially do we commend it to the consideration of those Congressmen whose indifference or blind opposition is responsible, more than anything else, for the present deplorable military situation.

Weight of Metal Versus Volume of Fire

ONE of the long-standing controversies in which the opposite sides have reached a common conclusion is that regarding the best kind of main armament for battleships. Some have held that the delivery of a large volume of fire of shells of moderate caliber, others that a smaller volume of fire of shells of greater weight is preferable. The former school found its chief support in the German navy, and the first battleships of their modern fleet carried nothing larger than the 9.4-inch gun, the ten battleships of the "Kaiser Friedrich III" and "Wittelsbach" classes mounting this piece in their main batteries.

It was not until 1904 that they completed in the "Braunschweig" a battleship mounting 11-inch guns, and eighteen of their battleships and battle-cruisers, completed between that date and 1911, had no gun heavier than this. In 1911 and 1912 they set afloat four ships of the "Thuringen" class mounting 12-inch guns, and these ships were followed by five vessels of the "Kaiser" class mounting the same piece. During all these years our own and the British navy were mounting the 12-inch, the 13.5-inch, and the 14-inch, and in the case of the British, the 15-inch gun.

The 15-inch gun was first mounted in the "Queen Elizabeth," completed last year, and by the end of the present year Great Britain will have completed eleven ships of the "Queen Elizabeth" and "Royal Sovereign" classes, each mounting eight 15-inch guns. That Germany has at last come down to the prevailing opinion is shown by the fact that her latest dreadnoughts of the "Friedrich III" class, to be completed in 1916 and 1917, each carry eight 15-inch guns of a type recently developed for naval purposes.

Comparing the weight of the individual shells, we find that the earlier German battleships threw one of 420 pounds weight from their 9.4-inch guns, against one of 850 pounds weight from the British 12-inch of that date; that the German 11-inch gun of the intermediate period fired a 650-pound shell from the 11-inch gun against shells of 860 pounds and 1,400 pounds delivered, respectively, by the British 12-inch and 13.5-inch guns; and that their latest ships in commission, of the "Kaiser" class, oppose an 860-pound shell from their 12-inch guns to the 1,920-pound shell of the British 15-inch guns mounted on the "Queen Elizabeth" class.

In explanation of the German preference for lighter guns, it has frequently been stated that those responsible for German naval ordnance believed that a greater volume of light shells would prove to be more effective than a smaller volume of heavier projectiles. This theory, if it existed, was held in the days when it was believed that, because of the generally hazy conditions in the North Sea, engagements would be fought at from 6,000 to 8,000 yards range. If these ranges had obtained there would be some force to the German theory; but the war has demonstrated that the admiral of a fleet, if he possesses the speed gage, will fight at the maximum range at which he can land effectively on the enemy. There has been one notable case in which the Germans failed to use an opportunity to put their theory to the test, namely, in the recent battle-cruiser fight in the North Sea. Here the German battle-cruisers, had they closed in to a range, say, of 9,000 to 10,000 yards, would have been in a position to perforate the 8- and 9-inch belts of the British battle-cruisers with their high velocity 50-caliber 11-inch guns, to say nothing of the 50-caliber 12-inch pieces carried by the "Derfflinger." At these ranges the greater rapidity of fire of the 11-inch guns would, under the German theory, have compensated considerably for the slower fire of the heavier and more numerous English pieces, particularly as the German ships are generally believed to carry much heavier belt armor. That they made a running fight of it, and left the "Bluecher" to its fate, indicates that the Germans believed victory would inevitably rest with the ships carrying the heavier guns.

Emotionalized Science

WHAT would the world think of a modern astronomer or physicist or botanist who should, after the example of Parmenides and Lucretius, compose a treatise on his science in verse? It is safe to say that the poem would not be read by lovers of poetry on the ground that the subject was not poetical, nor by students of science on the ground that one who is a poet is, *ipso facto*, too flighty a person to meddle with scientific matters. Yet there is ample evidence, even in modern literature, to prove that the wisdom of science may be married, with the happiest results, to immortal verse; and again, that neither poetry which ignores science nor science which rides roughshod over poetic moods and aspirations can be regarded as a particularly pleasing or wholesome product of the human mind.

When the Eiffel Tower was erected a storm of protest arose from the artistic world of Paris. The tower was not beautiful according to canons of taste formulated in an age which knew nothing of steel construction. To-day critics generally admit that the tower *is* beautiful, because every line has a structural meaning and every part is adjusted with marvelous skill so as to secure maximum strength with a minimum of material.

Science is essentially romantic. To-day the world stands spellbound before it, and would laugh to scorn a twentieth century Keats who should assert that "all charms fly at the mere touch of cold Philosophy" or raise a puerile lament at the unriddling of the rainbow. If we are sorry for Keats, it is not because science robbed him of his "awful rainbow once in heaven," but because he was blind to the immeasurably more awful meteor erected in its place by Newton and Young. Knowledge, coupled with the romantic temperament, leads to the highest delights of the spirit. Compare the formless yearnings of a poet to whom the starry canopy is little more than scenery and mystery with the overwhelming emotions of the astronomer in the presence of the universe. "I do think the thoughts of God!" exclaimed Kepler.

It seems rather banal to say that Tennyson carried farther than any other poet the dual task of utilizing scientific truths for the purely esthetic purposes of poetry and of infusing the spirit of poetry into the science of his day, or to revive the memory of his beneficent work in softening the shock of iconoclastic revelations; yet we believe that many scientific men to-day hardly realize how much a great poet can do for science by emphasizing its emotional aspects.

Tennyson's well-known trick of mingling scientific and classical allusions—the latest revelation of the telescope with an echo from Hesiod or Theocritus—was *a tour de force* only as a violent departure from conventional methods in poetry and not because of any essential incongruity in the things thus brought together.

Tennyson put the circular theory of storms into the lines

> Across the whirlwind's heart of peace,
> And to and thro' the counter-gale;

but did not Goethe put Luke Howard and his cloud-classification bodily into a poem?

Electricity

Introducing Electric Flatirons in South America.—The enterprising public utilities company of Rio de Janeiro, endeavoring to encourage the use of electricity in the household, has adopted the policy of giving an electric flatiron free with each gas stove purchased within a certain period. The experiment is declared to be very successful.

Iron v. Copper Wire in Germany.—Because large quantities of copper are used in the manufacture of ammunition for the German army and because the war has restricted the import of that metal, the German Association of Electrical Engineers has issued an announcement recommending the use of iron wire instead of copper wherev possible. The substitution can readily be carried out in direct current installation, but where alternating current is used, it introduces complications because of the skin effect and the increased impedance.

Electric Water Heater.—A very compact little electric stove has been put on the market which is particularly adapted for heating a tumbler or glassful of water in a very short space of time. The heating element is in the form of a cylinder, slightly under an inch in diameter and about 4½ inches long, which is provided with a metal cap arranged to fit over the mouth of the glass This serves to retain the heat and also keep out dust and dirt. The switch in the cover controls the current. The heating element generates sufficient heat to bring a glass of water to a boil in a minute and a half. The device consumes 450 watts.

Electric Lamps in the United States.—According to a recent report of the Bureau of the Census, in 1912 there were 560,981 arc lamps wired for service in use in the United States, as against 85,557,819 incandescent lamps. The number of arc lamps showed a drop of about 55,000 since 1907 while the incandescent lamps showed a gain of nearly forty million. The number of electric lamps used for street lighting in 1912 is given as 348,643 arc lamps and 681,379 incandescent lamps. The geographical distribution of the lamps shows nearly eight million for the New England division, twenty-two million for Middle Atlantic, nearly nineteen million for East North Central, eight million for West North Central, nearly four million for South Atlantic, two million for East South Central, three million for West South Central, two million for Mountain and nearly eight million for the Pacific division.

Emergency Street Lamps.—Apparently Chicago is so accustomed to having joy riders run amuck on its boulevards at night, and wreck its lamp posts, that it has provided emergency lamp posts to be used on such occasions. The lamps that furnish the special object of attack for the rollicking, devil-may-care motorist are those located at street corners in the so-called "Isles of Safety." Surely this is a misnomer so far as the lamps are concerned. But, be that as it may, there can be no doubt that after the lamp has been smashed these concrete obstacles in the middle of the avenue become a dangerous menace to the careful driver as well as to the reckless one. Accordingly, emergency lamps are kept on hand which may be set in place at once. The lamp post consists of a gas pipe standard attached to a hand-hole cover fitted with fuses and connection terminals. Spring leaves on the cover serve to hold the post upright when they are forced into the hand-hole. At the top of the post are four carbon-filament lamps inclosed in a red globe. This serves as a light-buoy for the rock in the path of navigation. However, it would seem as if the Isles of Safety could be turned into real refuges for pedestrians were they better fortified against attack.

High-lift Centrifugal Pumps.—Electric motors for pumping purposes are now used to good advantage for high lifts, and the new turbine pumps for such combinations are said to be much better than piston pumps which were hitherto used. Formerly centrifugal pumps were only used for low lifts, but the modern multiple stage pump can be designed to pump against a head of 3,000 feet or more, and the limit in this direction is as unrestricted as with any form of plunger pump. Again, the efficiency compares favorably with that of the latter type. But a great advantage lies in coupling to high-speed electric motors or steam turbines. As an example, we have a mine pump group for delivering 670 gallons per minute against a head of 1,500 feet, the speed being 1,485 revolutions per minute. An electric motor occupies the middle of a long foundation plate, with a turbine pump coupled on each side. Pumps of this class often have five stages, the water passing into five successive chambers with a turbine wheel in each, so that each stage adds more pressure to the water, and it thus leaves the pump at a high pressure. Other uses are for feed pumps for steam boilers, for blast furnaces, and the like. A good example of a large double pump with electric motor is seen in the type of colliery pump which is capable of lifting 1,150 gallons per minute to a height of 2,420 feet when running at 1,485 revolutions per minute. Between the two pumps is mounted on separate foundations a three-phase, 1,250 horse-power, 5,000-volt electric motor. The present system is of English make.

Science

Bacteriological Examinations of Hamburger Steak.—In two recent contributions to the *American Journal of Public Health* Messrs. Weinzirl and Newton describe a new method of determining the bacterial content of meat, in which the meat is ground in a mortar with sterile sand and normal salt solution to obtain an emulsion for inoculation into the culture media, and report the application of this method to the determination of the bacterial content of a number of samples of market Hamburger steak. The result showed that the standard of 1,000,000 bacteria per gramme sometimes advocated as a maximum limit for the salable product is much too low, as nearly all the samples examined would be condemned on this basis, though showing no taint or other evidences of putrefaction. The authors propose a limit of 10,000,000 bacteria per gramme, though even on this basis about 50 per cent of the market samples of Hamburger steak would still be condemned.

The Book of the One-armed.—Of interest in this era of war when so many men are maimed one way or another is the "Book of the One-armed," written by Count Géza Zichy and issued in Germany. It is intended to show how men who are one-armed can with a single hand be independent of the help of others. When a young man Count Zichy lost his right arm, yet in spite of this misfortune he has become a distinguished pianist and is known as "the left-handed virtuoso." The count had long wished to narrate his experiences to fellow-sufferers, so as to show them how he had risen above his infirmity and by what means he had managed to depend on himself alone in all that requires hands. The present moment seemed to him the right time to carry out his plan, and he recounts his experiences in the struggle for self-help with an amiable humor which should encourage those who, brave as soldiers or in the ordinary cares of life, are disheartened at a fate that seems to keep them in a constant state of dependence.

Prof. Benjamin Sharp.—The announcement was recently received that Prof. Benjamin Sharp, for many years known as a zoologist of note, had recently died at Morehead, S. C., in his fifty-sixth year. Dr. Sharp graduated from Swarthmore College and the Medical School of the University of Pennsylvania, which in 1891 conferred upon him the degree of Ph.D. He continued his studies abroad at the University of Würzburg, which conferred a Doctor's degree upon him, and he also studied at the universities of Berlin and Leipsic, and at the Zoological Station at Naples. Returning to this country he held the professorship of invertebrate zoology at the Philadelphia Academy of Natural Sciences, and at the University of Pennsylvania, and was formerly Corresponding Secretary of the Philadelphia Academy of Natural Sciences. He was with the first Peary expedition to the Arctic, and also did much special work in the Hawaiian and Caribbee Islands,

Abacá (Manila hemp) has been for more than a quarter of a century the leading export product of the Philippines, and during part of this time has comprised more than two-thirds of the total value of Philippine exports. The production of this fiber on a commercial scale has always been confined to the Philippine Islands. Recently, however, the prosperity of this industry has been seriously threatened by the increased production elsewhere of machine-cleaned sisal, together with a deterioration in the quality of abacá. While sisal is of generally uniform quality, the output of abacá has been extremely heterogeneous in character, and there was no uniform system of grading and marking. This situation has now been met by the Philippine Legislature which recently enacted a law covering the inspection, grading, and baling of abacá, maguey, sisal, and other fibers, to become effective January 1st, 1915. The subject is discussed in detail in the last quarterly number of the *Philippine Agricultural Review* for 1914, nearly the whole number being devoted to the abacá industry.

The Smithsonian Tables.—The recent appearance in a sixth edition of the Smithsonian Physical Tables makes timely a review of the valuable series of publications to which this belongs. In 1852 the Smithsonian Institution published the first edition of the Smithsonian Meteorological Tables, compiled by Dr. Arnold Guyot, primarily for use in connection with the system of meteorological observations established by the Institution about 1850. These tables included much material of general application in physics and were widely used by meteorologists and physicists all over the world. A fourth edition of "Tables, Meteorological and Physical" appeared in 1884, and was a work of much greater size and scope than the original publication. Subsequently it was deemed expedient to subdivide the subject-matter of these tables, and accordingly three independent series were founded; viz., meteorological, physical, and mathematical. The meteorological tables, in the new series, have appeared in four editions, while a fifth is now under consideration. The geographical tables have been issued in three editions. The first separate edition of the physical tables appeared in 1896. Finally, a fourth series is the Smithsonian Mathematical Tables (Hyperbolic Functions), issued in 1909.

Automobile

British Daimler to Make Gnome Motors.—The famous Gnome rotary gasoline motor is to be made in Great Britain during the war by the Daimler Company at Coventry. The Daimler product is rated at 80 horsepower, and is to be used in aeronautical work.

An Anti-freezing Liquid.—Many anti-freezing mixtures and preparations have been proposed at various times, but there is one that is seldom mentioned which is said to be excellent in many cases. This is plain kerosene, which will not freeze at any temperature experienced in this country, and also has the advantage that it has a tendency to clean any dirt out of the radiator. It is claimed that kerosene will not in any way injure the majority of radiators; but it should not be used in cars that show a tendency to run hot and boil the water in the radiator, for as kerosene has a lower evaporative point than water it would be wasted rapidly in a hot engine.

Paris to have Improved Autobuses.—It is well known that most of the public autobuses in Paris have been taken by the government to serve as military transports, in which work they have proved unexpectedly successful. Even if these vehicles are in condition for further service after the war is over they will not be returned to Paris, but such as can be utilized will be found in the small towns carrying commercial travelers to and fro between the station and the hotel. Already plans have been made for more modern and more elegant buses for Paris, and the new model proposed will be roomier, with higher windows, and will weigh considerably less than the old vehicles.

Motor Squadrons of England.—There has been much activity of late in the open spaces around London where military motor squadrons have been practising maneuvers. Each squadron is complete in itself, and consists of a large armored car having a Maxim quick-firing gun mounted in a revolving turret. A second car carries a 1 or 3 pound gun. For these there are two supply cars; and the squadron also includes a red cross car. These combinations are so complete and mobile that they have been found extremely valuable, especially in the skirmishes that so frequently take place in villages. Since the prompt rounding up of DeWet on the occasion of his recent revolt in South Africa, the appreciation of the value of motor cars has greatly increased.

American Motor Trucks for the War.—Many items have been going the rounds in regard to orders placed in America by foreign powers for motor trucks to be used in the military operations, Most of the published statements have been erroneous, but in two cases the exact figures for orders thus far received are known. One large concern has contracts for 1,200 trucks of 2-ton capacity, fitted with special bodies; while another equally prominent builder has delivered 300 2-ton trucks and has orders for 300 5-ton trucks for immediate delivery. The purchaser in both of these cases is the French government, which has found the American cars perfectly satisfactory. One of the concerns alluded to also has received an order for trucks from the British Admiralty which is now being filled.

Keeping Inner Tubes Soft.—Much money is lost annually by private motorists and by dealers in rubber tires and tubes in small communities, because of the tendency of the rubber tubes to become hard and brittle after a few months of storage. To fold up tubes, cover them with chalk and put them in pasteboard boxes is only a makeshift. They will lose their resiliency after a while. A German rubber manufacturer not long ago furnished to all his dealers instructions as to how best to care for inner tubes. According to these, the best way to preserve tubes is to blow them up to the pressure in an ordinary rubber ball; to hang them upon one or two fairly thick round poles, stretched horizontally, in a darkened room, in which a dish of unslaked lime and one of ammonia solution are placed in the corners on the floor. This arrangement keeps the air free of destructive acids and retards the process of vulcanization which goes on in the tubes.

Substitutes for Gasoline.—The efficiency of the German military motor transport service, in which substitutes for gasoline, such as benzole and alcohol, are very extensively employed, is gradually forcing the attention of engineers and investigators to the fuel question, and calling attention to the very material advance that Germany has made in this direction. In America, when cheaper fuel is mentioned to an automobile maker or dealer the reply too often is that the price of gasoline has not gone up, consequently there is no necessity for worry. But how long will this condition last? And in the meantime why should motorists pay twice what they should for fuel? Too many people in the automobile business are so unwise as to persist in regarding their product as a luxury, in regard to which no one should consider the question of expense; but some of the wise business men in the trade are quietly pressing forward their preparations for meeting the new conditions that are sure to come.

The Sixth Award of the Scientific American Medal for Safety Devices

By William H. Tolman, Director American Museum of Safety

SEVEN years ago the American Museum of Safety was founded by a small group of those interested in safeguarding life and limb from industrial and other accidents. The trustees were largely editors of technical journals, which supported the new movement with great enthusiasm. This movement has grown and grown until we have three Museums of Safety in the United States—one in New York, one in Boston, and one in San Francisco, the two latter being modeled on the parent Museum in New York. The American Museum of Safety has been an inspiration for the entire country and has resulted in the formation of "Safety First" societies, committees, etc., numbering hundreds. Early in the history of the Museum it was felt that some encouragement should be offered to corporations and individuals to invent and install safety devices, as well as to look after the welfare of employees. The SCIENTIFIC AMERICAN was the first to offer a medal for this purpose, and it has now been awarded six times for the most efficient safety device invented within three years of the award and exhibited at the Museum. In the SCIENTIFIC AMERICAN of February 7th, 1914, the first five winning devices were illustrated and described. To recapitulate: The SCIENTIFIC AMERICAN Medal has been awarded as follows:

1908. The Rich Marine Fire Extinguisher Company.
1909. The Patent Scaffolding Company.
1910. The Norton Company.
1912. For the Pulmotor.
1913. The Welin Marine Equipment Company.

The annual exercises and the award of the Museum medals took place on February 10th in the auditorium of the United Engineering Societies Building, President Arthur Williams in the chair. The SCIENTIFIC AMERICAN Medal was awarded first on account of seniority.

The inventor of the winning device is Mr. Glenn S. Williamson, mechanical superintendent of the New York *World*. Mr. Williamson was appalled by an accident in a neighboring building in which a well-known jurist fell in the elevator shaft through an open door to his death thirteen stories below, so he then devised the system illustrated herewith, and this has been operated on several elevators in the *World* Building and also in other tall structures with great success. In awarding the medal, Dr. Frederick R. Hutton, Vice-President and Chairman of the Bureau of Awards, said:

"The general principles on the basis of which the Museum recognizes successful achievement are six in number:

"(1) Applicability. Does the device secure safety for a large number of persons or in a great variety of conditions.

"(2) Practicability. Can the device be used economically and successfully? It must not be too cumbrous or intricate to apply or operate.

"(3) Simplicity. It must not be so complicated that experts are required to handle or keep it in repair.

"(4) Reliability. It must not be liable to derangement or failure to work in emergencies.

"(5) Durability. It must not be so delicate or need such fine adjustment that it will not stand up in service.

"(6) Commercial availability. It must not be too expensive to install or maintain in operation; it must be obtainable in an open market for the use of all.

"The first medal in the history of the Museum to be created and awarded was the SCIENTIFIC AMERICAN Medal. It was first given in 1908, and the foregoing criteria were created to guide the jury in awards in its class. It is given to such individual or corporation as has produced and exhibited in the American Museum of Safety a perfected device of utility which best conserves human life and limb in the processes of productive industry or other avocations. The award this year is given to an individual and the company which he has created to give permanency to his undertakings for a device which shall secure safety to the general public which makes use of the elevator systems in our great office and other buildings, stores, and hotels. It meets the requirements of the conditions of award and is made, in addition, to command the special approval of the jury because it involves and in a most simple and direct way the application of what safety calls 'the interlocking principle.' That is, a construction makes it mechanically impossible to open the hatchway door either from within or without until the car is at the landing or within four inches above or below it. Secondly, it is impossible to start the car from the landing until the hatchway gate is closed entirely or so nearly closed that no part of the human frame can be forced through the opening. For its attainment of mechanical safety and the prevention of obstinate or reckless humanity from doing what it ought not to do, the Museum awards the SCIENTIFIC AMERICAN Medal to the Shurloc Elevator Safety Company, Inc., and to Mr. Glenn S. Williamson, the designer of the mechanical details of the device."

The Scientific American Medal.

A description of the device will prove interesting. Safety of passengers getting on or off elevators can only be assured by three things:

(1) By holding the elevator car immovable at a safe landing while the gate is open.

(2) By locking the gate shut before the car can be moved up or down the shaft.

(3) By keeping the gate shut and locked when the car is away from the landing.

To be effective, these essentials must be mechanically compulsory, as with an interlocking switch and signal, by maintaining a unit of safety at each gate which operates when the car reaches the landing.

In the system here described each unit works independently of all the other units and cannot by any known means tie up or interfere with the regular operation of the elevator, which is an ever-present possibility whenever the locking system is unified with all the doors in the elevator shaft.

The unit of safety in this system is a locking mechanism on the sill in the elevator shaft at the bottom of the gate and to the side of the car. The car carries an equipment by which the lock is operated mechanically from the car, thus controlling the opening of the door.

The accompanying photographs are of a working model of wood, of which the car floor *X* is cut away to show the car equipment and operation.

Fig. 1 shows the Shur-Loc mounted under the gate and the gate locked; also the car equipment with the controller at running position.

Fig. 2 shows the controller locked in a neutral position, the projecting shoe gripped by the retaining bolt, the gate unlocked and opening. The mechanism is shown with its cover removed.

With this system, before anyone can leave or enter the elevator car it must be brought to the landing in front of the gate, the controller must be placed in a neutral position, stopping the car, and then, by simply stepping on the pedal (1) in the car floor near where he stands, the operator *locks* the controller and unlocks the gate.

When he steps on this pedal it raises the locking rod (2) and locks the controller, as shown in the photograph. It also projects the contact shoe (3) against a lug behind 3, forcing back the catch (5), which releases the shoe (6), thereby unlocking the gate. While the gate is unlocked the elevator door may be opened and passengers can leave or enter the car in perfect safety, for the car cannot be moved either up or down while the gate is open or unlocked. The car cannot move because when the shoe (6) was released from the first catch (5) the steel retaining bolt (7) gripped the contact shoe (3) and secured it in its projected position, where it holds up the rod (2) and keeps the controller locked so the car cannot move.

The car cannot be started until the shoe (3) is released, and it can only be released by shutting the gate, which is securely and mechanically locked by the first catch (5) when it gets back in closing to within four inches of the jamb. Here the retaining bolt (7) will instantly release the contact shoe (3) and allow the locking rod (2) to fall by gravity so as to unlock the control and let the operator start his car.

It is obvious that as locking the gate unlocks the controller the car cannot start until after the gate is locked. Consequently, no one can possibly pass through the gate after the car is started. The unlocking of the controller is simultaneous with the locking of the gate, and unlocking the gate and locking the controller are simultaneous with the pressure of the operator's foot on the pedal, which locks the control and unlocks the gate. There is no delay to the elevator. A quick, safe landing and getaway are assured. One pressure of the foot when the car reaches the landing anchors the car and frees the passengers. After the gate is locked on the first latch it takes only a few seconds for it to close the last four inches and again lock tight shut on the second latch. Meanwhile the operator's mind acts, he moves his controller and away goes his car. The entire operation is automatic and mechanical and enacted from the inside of the car while it is stationary at a safe landing. If the operator steps on the pedal while the car is moving anywhere in the shaft the inside spring with which the pedal is provided absorbs the pressure and nothing happens, because the rod cannot be raised nor the shoe projected while the controller is in the running position.

This device has an extra feature, not essential to safety perhaps, but which will appeal to all users of elevators. This is a light to illuminate the threshold of the car while the gate is open. An electric switch controlling a light is fixed under the car in a strong metal box and operated by the same pressure which projects the shoe, thus simultaneously illuminating the threshold of the car when the door is open.

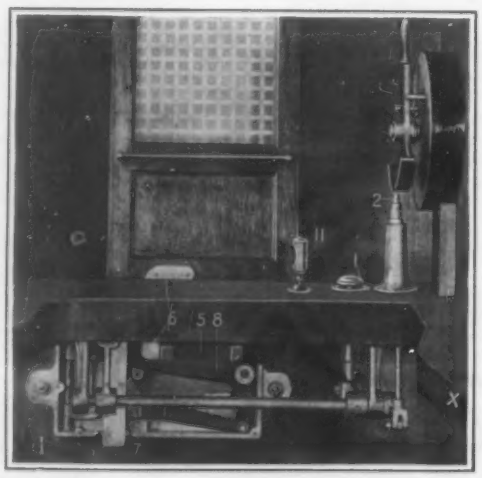


Fig. 1.—Gate locked and controller in running position.

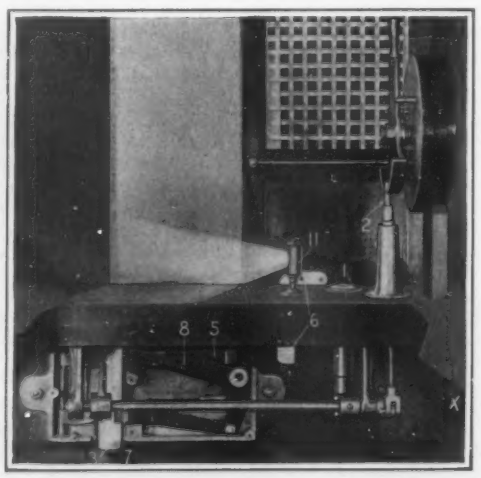


Fig. 2.—Controller locked in neutral position and gate unlocked.

The other medals which were awarded were: The Traveler's Insurance Company's Medal, which was given to the Commonwealth Edison Company of Chicago; the E. H. Harriman Memorial Medals in the railway field, which were awarded to the New York Central Railroad Company; and the Anthony N. Brady Memorial Medals in the street railway field, which were awarded to the Boston Elevated Railway Company.

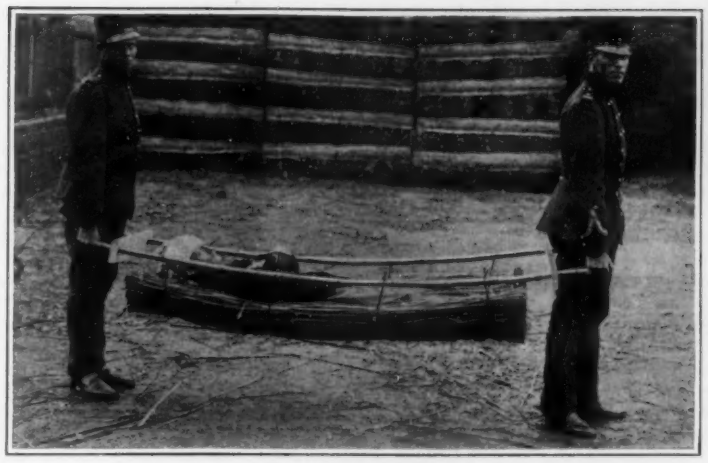
Hon. Dudley M. Holman made the principal address.

Stretchers of Straw for the Dutch Army

By W. J. L. Kiehl

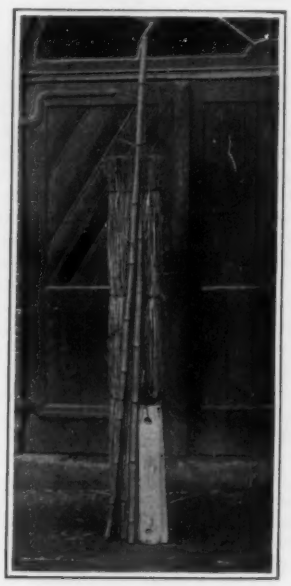
A NATIVE of Netherlands has invented a very practical stretcher for army use, also a field-bed of similar construction, which will be found very comfortable and warm. The stretcher consists of a mat of straw with a reinforcing of willow or reed on the underside. This is fastened to a couple of bamboo poles which serve as handles. A couple of spacing boards keep the mattress spread out fairly flat when in use, as shown in one of the drawings. A roll of straw serves as a pillow. With the bamboo poles removed the mattress of straw will be found serviceable, as a bed, even on damp ground, and a blanket, also of straw, may be used to keep the sleeper warm.

These straw stretchers were first used in conveying the wounded of the British cruisers sunk off Holland's coast, and since then they have seen service on the southern frontiers of Netherlands. Many a sick and wounded Belgian refugee or soldier has stretched his weary limbs on these straw beds. They promise to be especially useful in times of epidemic, for their inexpensiveness allows of their being burnt after use, so that there will be no danger of spreading infection. When not in use they may be rolled up and piled in stacks as shown in one of the photographs.



Stretcher of straw used in the Dutch army.

Bed, pillow, and blanket of straw.



The stretcher folded up.

Manufacture of Optical Glass in America

THE glass used in this country for the manufacture of lenses is practically all imported except in the case of some of the smaller and cheaper lenses. For several years past the Bureau of Standards of the Department of Commerce has been endeavoring to persuade the glass manufacturers of the United States to take up the manufacture of this material, but they have been unable to do so, partly because of the limited quantity used as compared with other glass, but largely on account of the varying composition required and the difficulty of annealing the glass, as good optical glass must be entirely free from strain.

With a view to working out some of the underlying problems sufficiently to enable manufacturers to start in this matter, the Bureau secured two years ago an expert interested in the composition and testing of optical systems, and a little later secured another man skilled in the working of glass to the definite forms required by the theory. These steps were taken, first, partly because it is exceedingly difficult to find men having these qualifications, but principally because, as the work of experimental glass-making progresses, the glass must be put in the form of lenses and prisms to test; in other words, the Bureau had to be in a position to examine the product, as it was made experimentally. In July, 1914, a practical glass-maker was added to the force of the Bureau. He is a college graduate of scientific training, but skilled in the manipulation of furnaces, and is the sort of a man to make progress at the present stage of the work.

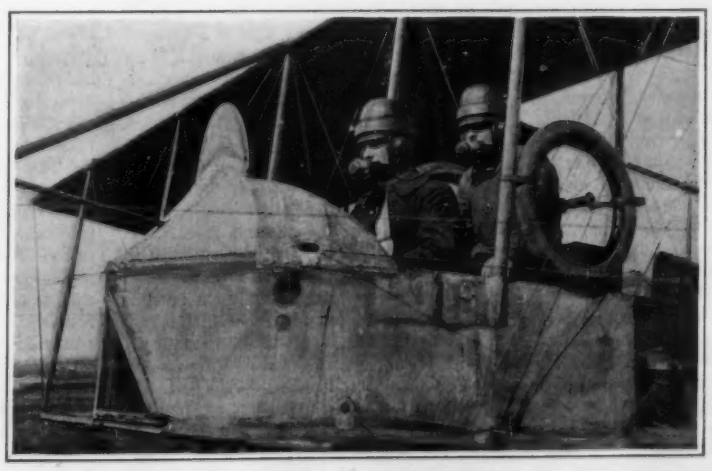
Small furnaces were built and melts of a few pounds of ordinary glass were made in order to become more familiar with the technical side. A larger furnace has just been completed, which will handle melts of 25 to 50 pounds. The Bureau is now making glass according to definite formulas, studying the methods of securing it free from bubbles, and other practical points. This is to be followed by an investigation of the method of annealing.

Several glass manufacturers have visited the Bureau already for suggestions as to equipment for the manufacture of optical glass.

Mechanical Aids for Air Scouts

IN carrying out scouting observations with military aeroplanes it is essential that there be two men in the machine, namely, a pilot whose sole duty it is to operate and steer the craft, and an observer who can devote undivided attention to scanning the ground below him and making sketches of fortified works, the disposition of the enemy's guns, the movements of their troops, and the like. Unfortunately, the great noise made by the motor renders it impossible for the two men to carry on any conversation. Often this proves quite a drawback for a proper understanding between pilot and observer. To remedy this defect a loud-speaking telephone system is now in use between pilot and observer in some of the French military aeroplanes. As the accompanying photograph shows, each man is provided with a special helmet fitted with receivers over the ears and a transmitter located in convenient range of the mouth. This has proved to be a most practical way of keeping up a conversation in spite of the deafening noise of the motor.

A Dutch soldier in his bed of straw.



The roaring aeroplane motor makes telephone communication necessary.

A still further improvement is shown in our front page illustration. If the observer is to make sketches of the ground over which he is flying, he will be so much occupied, probably, as not to have time to jot down notes. Sometimes events may follow in such rapid sequence that he may not have time to write down all he would like to. In certain conditions of flight, it might be difficult to use pencil and paper. In order to remove all obstacles that might hamper the observer's work, a phonograph is now provided, with a speaking tube running to the observer's mouth, so that he may talk into the machine at any time during the flight and thus make a record of his observations, while at the same time his hands are free for the use of field glasses or the sketching pencil. At the end of the flight the phonograph delivers its message.

The Search for Standard Weights and Measures of Length

THE use of melted quartz for the manufacture of standard measures of length has been a great disappointment, since even this material is subject to very marked fluctuations in length. The search for a suitable material is, however, being continued, because platinum-iridium, which has been used up to the present, is out of the question for practical purposes on account of its great cost. Dr. Guillaume discovered the alloy, which has become known under the name of "Invar," an abbreviation for "invariable." This nickel-steel alloy would make an ideal material for standards of length on account of its great resistance to changes in temperature, but unfortunately it is not proof against chemical action. For this reason it is suitable only for standards of the second grade, in which accuracy within a millionth part is sufficient. The ideal material, possessing the advantages of platinum-iridium, but less expensive than the latter, is therefore still to be found. Similarly good materials for standard weights have been sought extensively and various non-magnetic nickel alloys have been tested. Among these "Constantan" has proved to be inconstant, in spite of its name.

Another alloy, "Baros," has found considerable favor. It is produced by alloying ordinary nickel with a little chromium and manganese. Still more is expected of tungsten, on account of its hardness, its great density, and its durability. For the present tungsten is still too expensive, but very likely it will be obtainable at lower prices in the near future, since it is very much in demand. A review of the progress in the use of the metric system shows that during the last six years Denmark, Siam, Belgian-Congo and some of the Central American states have adopted this decimal system. The most important success still to be gained by the metric system, the conquest of England and of the United States, seems, however, still far removed, although Dr. Guillaume himself thinks that the difficulties in the way of its adoption by these countries are much exaggerated by his opponents.

Doing Without Europe—IV

How Industrial Research Will Help the Manufacturer Hitherto Dependent Upon Europe for Basic Materials

A FEW weeks ago we read in the newspapers that Thomas A. Edison, needing carbolic acid out of which to make phonograph records, and finding his source of supply cut off by the war, set to at once and started to make carbolic acid on his own account. In last week's SCIENTIFIC AMERICAN we cited the case of Mr. Maximilian Toch, who had to have barium, and who bought a deposit and an old plant in Tennessee and established what promises to be the first healthy American barium industry.

These are not isolated instances of manufacturers who have boldly started plants in this country and declared themselves industrially independent of Europe. There are about twenty-five gas mantle factories in the United States of America, all of whom are more or less dependent upon Germany for their stocks of the rare earth which is used to impregnate gas manties. At least one firm, the Lindsay Light Company of Chicago, is now manufacturing its own thorium nitrate and cerium nitrate from Brazilian monazite sand, and has erected its own monazite refinery, gas being exclusively used in the process of extracting the thorium and cerium nitrate from the sand. In lithographing presswork leather rollers are almost entirely used for printing. This has always been the custom, since lithography requires both ink and water in handling the stone. A rubber roller acts as a repellent to the water and does not give satisfactory results; a leather roller absorbs a certain amount of the water and at the same time provides an excellent surface for distributing the ink. Before the war all the leather for making rollers was imported from Germany. German leather seems to be exceptionally smooth and soft. The leather in this country is tanned too quickly and the tanning method adopted leaves the leather in a harder condition. Since the outbreak of the war several firms have been making a study of the subject, and one firm at least is beginning to turn out almost as good a quality of skin as could be desired.

Science May Prove the Salvation of Our Industries.

It so happens that the men who have tried to make here what formerly they imported from Europe are, for the most part, scientists or engineers. Mr. Edison, for example, is probably the greatest manufacturing inventor in the world. Mr. Toch is a chemist who is an authority on paints. The men at the head of the Lindsay Light Company are chemically trained. It is but natural that these men should be the first to strike out for themselves; for they knew that in industrial research, the very branch of knowledge with which they were most familiar, lay their salvation.

The lesson which they have been taught should be learned by every American manufacturer who has been dependent upon Europe. It is sad but true, that American manufacturing companies, as a whole, are indifferent to the possibilities of industrial research. We find them lavishing enormous sums on wonderful mechanical equipment and fancying that good machinery is the beginning and end of manufacturing efficiency. It may be that the war will dispel this illusion and that the American manufacturer will take something like a Teutonic interest in the chemical and physical side of his own business. Only our very largest corporations realize the absolute necessity of maintaining well-equipped research laboratories to improve old manufacturing processes and to devise new ones. The Chicago packing industry, the cottonseed oil industry, the electric lamp industry, the powder industry grew to enormous proportions, not only because of the millions and millions invested by financiers, but because of the industrial research which they conducted.

What Research and Invention Did for Cotton.

Think, for example, what has been achieved by industrial research in converting the wastes of the cotton gin into a hundred different valuable edible products.

In 1872 only 52,000 tons of cottonseed were crushed. At the present time the average annual crush is over four million tons. In 1872 farmers received not over $8 per ton from the mills or $416,000 total, while to-day they are receiving $20 per ton for seed, with the result that the mills are paying to them over $80,000,000 annually.

This remarkable development in the cottonseed oil industry is due very largely to the work of the chemist. The early refining methods were crude. In 1900 the present system of refining was introduced, with the result that it is now possible to turn out perfectly neutral, odorless oils with such uniformity that cottonseed oil and its products must now be classed with granulated sugar.

What the chemist has done for the oil mills as a whole can be figured in dollars and cents as follows: The old method of working made 800 pounds of meal and left in it 10 per cent of oil or 80 pounds of oil per ton of feed. The present methods make 900 pounds of meal and leave 7 per cent of oil or 63 pounds, a difference of 17 pounds of oil saved per ton of seed worked. At 5 cents per pound, this means a saving of 85 cents per ton of seed, or $3,400,000 on the crop.

It is the purpose of this article to show how industrial research can assist a manufacturer in devising processes for making the goods that he has been in the habit of importing from Europe and that he can no longer obtain because of the war. If the manufacturer will only realize that no matter how perfect his manufacturing processes may seem to him they are always capable of scientific improvement, he will succeed not only in making himself independent of Europe for the time being, but forever. He will enrich his country with a new industry and employ labor in new fields.—EDITORS.

If we compare the old refining methods with the new, we find, instead of 12 per cent loss, an average of 8 per cent; 4 per cent of 3,200,000 barrels worth 5 cents per pound, $20 per barrel, or $2,560,000.

Converting Cheap Oils into Profitable Fats.

Perhaps the most marvelous aspect of the research which has taught us how to extract from cottonseed marketable products is that which is based upon the discovery of two French chemists, Sabatier and Senderens. These two Frenchmen discovered that unsaturated fatty acids or their glycerides can be converted into saturated compounds. Stated less technically, they discovered a way of converting oils and soft fats into hard fats. Cottonseed oil costs about 4 cents a pound; by a modification of this process introduced by the French chemists it is converted into an excellent substitute for lard, which sells at 16½ cents a pound. The cost of the transformation varies from ½ to 1 cent a pound.

To understand how this is effected, we must understand what a fatty acid is. Chemically a fatty acid may be described as a body compounded of carbon, hydrogen, and oxygen. A glyceride is a fatty acid containing glycerine and having the same compounds, namely, carbon, hydrogen, and oxygen. The difference between a saturated fatty acid and an unsaturated fatty acid is the difference between a fluid and a solid. Glycerine to-day sells at 18 cents a pound, and corn oil or cottonseed oil at about 6½ cents a pound. By using this process 100 pounds of corn oil can be made to yield 12 pounds of good glycerine. Similarly the conversion of soap stock into fatty acid and glycerine has raised the value of the fat therein at least 3 cents per pound or $12 per barrel. In refining 3,200,000 barrels of oil, 7 per cent would appear as fatty acid in soap stock, 224 pounds of which at $12 per barrel would be $2,688,000. By making the oil edible, $2.50 per barrel is a conservative figure to put on the increased value of the oil on 3,200,000 barrels. This amounts to $8,000,000 a year.

A Miracle Wrought by Hydrogen Gas.

And how is this marvelous result attained? Merely by means of hydrogen gas. It appears that in the presence of or in contact with certain metals, chemical bodies undergo changes which do not otherwise take place. The reactions induced by the presence of what is known as a catalyst involve merely the splitting up of a single chemical body, of which the decomposition of acetylene in the presence of finely divided nickel is an instance, or the combination of two chemical bodies which, but for contact with the catalyst, would have retained their compositon unchanged, although in contact with one another. The hydrogenation of a fatty acid, where hydrogen and the fatty acid are brought into contact in the presence of a suitable catalyst, is an instance of the latter kind of reactions, and that which forms the basis of most of the industrial processes here outlined. The catalyst is a metal such as fine nickel powder.

At least seven companies are busily engaged in thus converting soft fats and oil of small value into edible hard fats of great value. But the process is capable of much extension. We find that industrial research is now being conducted by the very large companies to harden other oils besides those extracted from corn and cotton. When tallow drops very low, for example, it might not always be profitable to convert a soft fat into tallow. It has occurred to one large manufacturer that perhaps fish oil might be thus hardened and the market steadied. Fish oil will always be cheap. A process has now been devised which will enable that company to hydrogenate fish oil and to convert it, for instance, into a soap quite free from all fishy odor.

Naturally research of this kind can be conducted only at enormous expense in a finely equipped laboratory. But the small manufacturer can easily improve his own manufacturing processes or even start to employ processes specially created for him by employing outside chemists. Columbia University, the University of Pittsburgh, the University of Illinois, the Massachusetts Institute of Technology; in a word, most of our foremost universities, technical schools, not to mention dozens of privately practising chemists, will be glad to help him at a cost ridiculously low compared with the results that may be expected. Already the thirty-nine men in the Mellon Institute of the University of Pittsburgh are in part employed in solving the industrial problems which have suddenly arisen because of the war.

Opportunities Created by the War.

We heard so much of the coal tar chemical industry at the outbreak of the war, of the difficulties with which textile manufacturers in particular were confronted because of the shortage of coal tar dyes, that the full industrial effect of the European conflict is even yet not fully realized. In the preparation of this article it was deemed advisable to obtain firsthand information which would show just what American industries had been most injured by the cessation of importations. Accordingly, the author passed several days in the United States Appraisers' Office in order to obtain a general survey of the situation.

All the chemical industries have been hard hit—not the users of coal tar chemicals alone. Since carbolic acid, for example, is extensively used in antiseptic dressings, England, the chief source of supply, has placed an embargo upon its exportation. A similar embargo has been laid upon mercurial preparations. The importation of oxalic acid, phosphoric acid, crude vegetable drugs, chemical salts and compounds, lime chloride, potash and potash compounds, and nitrates has suffered. Perhaps the industries which are dependent upon European potash are most profoundly affected, mainly because the chief source of potash is Stassfurt, Germany. A complete list of the articles which we need most follows:

Importations Which Have Decreased in Quantity Since the Outbreak of the War.

Gross almerode glasspot clay, fuller's earth, carbolic acid, phosphoric acid, calomel, chemical salts and compounds, crude drugs (most of the organic drugs come from Hungary), coal tar medicinal preparations, mercurial preparations, mineral salts, magnesia (loose), anilin salts and oil, coal tar colors and dyes and drugs, alizarin dyes, fusible enamels in canes, etc., madder, Paris green and London purple, red lead, sumac extract (used in the silk industry), mesothorium, lime chloride, cadmium (for colors), phosphorus, potash and potash compounds, camel's hair (for brushes, etc.), deer skins, mohair, wool waste and rags, wool yarns (embargo by England), lentils (grown chiefly in eastern Prussia), potato flour, grain alcohol, alcoholic beverages, beer, fruit syrups (prune juice), German wines, mineral waters, chemical glassware and mortars, scientific instruments, crucibles, glass strips, lenses, silica ware, spectacles, eyeglasses and goggles, X-rays tubes, musical instruments, horsehair (artificial), felts (wool and hair, machine and piano), blankets, press cloths for oil presses, camel's hair cloths for oil presses, billiard cloth, broadcloths (German), German wools and worsted, imitation pearls, beads, burlap for bags, glassware, precious stones, enameled ware, metal clippings for brass powder, thermos bottles and parts, aluminium flatware, carbons for electrical use, electrical instruments, gas mantles, baskets, catgut, firearms, hat wire, needles, pins, aluminium (exportation prohibited), antimony (exportation prohibited), ball bearings, ferromanganese, cylinders for gas containers, nickel and nickel alloys, asbestos (manufactured), magnesite (Hungary), lithograph stones (not engraved), dental instruments, surgical instruments, pearl for knife handles, engravers' plates and dies, roofing felts, vegetable ivory, paper, bronze powder, tin powder, nitrates (fertilizers).

The Difference in Cost Between American and European Labor.

Every one of these articles is a subject for industrial research. Given an abundance of raw materials and technical skill, and there is no reason why we should not succeed in establishing the needed industries in this country. But what about the difference in cost between American and European labor? Cheaper fuels and the raw materials ought to offset cheaper European labor costs in many industries. It cannot be denied, however, that a protective tariff of some kind will be required for some industries, as we pointed out in previous articles; also an anti-dumping law which would prevent a German trust, despite an American tariff, from deliberately selling below our lowest possible cost of manufacture.

The Government Ship Purchase Bill—I

A Defense of the Administration's Policy

By Judge Joshua W. Alexander, Chairman of the House Committee on Merchant Marine and Fisheries

This comprehensive, concise, and forceful article, defining the course of action of the Administration in its efforts to meet the existing emergency in our merchant marine, has been written at the request of the Editor by Representative Joshua W. Alexander, who introduced the shipping bill which has produced the present deadlock in Congress and has become the subject of bitter controversy throughout the country.

The case of the opponents of the bill will be presented in a future issue.—EDITOR.

DURING the fiscal year 1914 the foreign commerce of the United States amounted to four and a quarter billion dollars. The imports were nearly two billions of dollars and the exports over two and one-third billions of dollars. Not more than 10 per cent of this commerce was carried in vessels flying the American flag. It is estimated that foreign ship owners collect from the American people 250 to 300 millions of dollars a year for the ocean transportation of passengers and cargoes to and from the United States. This sum materially affects our trade balance. Just prior to the European war we had ships of only 1,376,809 tons gross in the foreign trade. It is estimated that soon after war was declared 5,500,000 tons of foreign shipping was withdrawn from the ocean carrying trade; and that 550,000 tons of German and Austrian shipping is interned in American ports.

The war in Europe had hardly begun when the American people became keenly sensible of the imperative need for an American merchant marine. England, France, and Germany, our principal carriers, were at war, and we needed vessels clothed with the rights of neutrals to carry our overseas commerce. The Ship Registry Act admitting foreign built ships to American registry for the foreign trade, and suspending temporarily the provisions of our navigation laws requiring the captains and watch officers on vessels of the United States to be American citizens, was passed August 18th, 1914.

The Administration was assured that the passage of this act would bring a large measure of relief.

No sooner was it passed, however, than the same interests called the attention of the Administration to the fact that Great Britain, France, and Germany were writing war risk insurance on vessels and cargoes under their flags, and unless our Government would do likewise the Ship Registry Act would not be much help. An act was promptly passed by Congress and approved by the President creating a War Risk Board in the Treasury Department and the Government has since written millions of dollars of war risk insurance on vessels under our flag. No serious objection was urged to this legislation upon the ground that the Government should not engage in the insurance business. The emergency had to be met and private companies were impotent. This measure was urged by the people who now object to the Government ship purchase bill and denounce it as paternalism and State socialism. They were to be the beneficiaries if the Government engaged in the insurance business. All the people will be the beneficiaries if the latter bill becomes a law.

After the Ship Registry Act and the act creating the War Risk Board were passed, it was represented to the Administration and to the committees in Congress having jurisdiction of the subject matter that on account of the disturbed financial conditions growing out of the war in Europe it was impossible for private persons, firms, and corporations to purchase foreign tonnage and bring it under the American flag, unless the Government would guarantee their bonds or lend them money, or in some other manner give them aid. This was the situation when I introduced the ship purchase bill.

With our foreign commerce paralyzed and our utter dependence on the shipping of Great Britain for service and her interests sharply antagonistic to our own, with ocean freight rates mounting higher and higher every day and facilities under our own flag distressingly inadequate, it was thought by those charged with responsibility in the premises, that if the Government must carry all these burdens in the interest of private shipping and give private shipping a free hand to exploit our commerce and charge all the traffic would bear, it would be wiser to provide by law for a Government owned and controlled merchant marine operated in the interest of the agricultural, manufacturing, and commercial interests of the United States, and give that service at reasonable rates and at the same time compel other lines to do likewise. And right here is the rub. There is no reason to believe that the Government will enter into competition with the established lines where they are giving the people good service and at reasonable rates. It would be folly to do so.

What are the fundamental proposals in the ship purchase bill now pending in Congress, which the shipping interests are opposing so violently?

The bill provides that the United States, acting through a shipping board, may subscribe to the capital stock of any corporation or corporations now or hereafter organized under the laws of the United States or of any State or of the District of Columbia, the object of such corporation to be the purchase or construction, equipment, maintenance, and operation of merchant vessels in the trade between the Atlantic, Gulf, or Pacific ports of the United States and the ports of Central and South America and elsewhere to meet the demands of the foreign commerce of the United States, or to charter vessels for such purposes and to make charters or leases of any vessel or vessels owned by such corporation to any other corporation, firm, or any individual to be used for such purposes, subject to the approval of the shipping board.

The initial stock of the corporation shall not be over $10,000,000, the shares of the par value of $100. The capital stock may be increased by the shipping board with the approval of the President. The United States shall subscribe for 51 per cent of the stock and each increase. The remainder may be subscribed for by the public, or by the United States if not subscribed for by the public. The United States, through the shipping board, with the approval of the President, is authorized to purchase or construct vessels; to transfer them to such corporation; and to pay for same by issue of Panama Canal bonds. Such corporations shall make provision for sinking fund and for depreciation charges, under the rules and regulations to be prescribed by the shipping board. The vessels purchased or constructed under the act shall be entitled to registry under the laws of the United States, but may engage only in trade with foreign countries or with the Philippine Islands, Hawaiian Islands, Porto Rico, and the islands of Guam and Tutuila.

The Secretary of the Treasury, the Secretary of Commerce, and three additional members, two of whom shall have practical experience in the operation of vessels in the foreign trade, subject to the direction of the President, constitute the shipping board, and are vested with power to vote the stock of the United States in such corporation and to do all other things necessary to protect the United States and to carry out the purpose of the act, and with the approval of Congress may sell the stock of the United States in such corporation.

The President is given the power to charter naval auxiliaries and vessels belonging to the War Department suitable for commercial uses and not required for naval or military purposes in times of peace, and vessels owned and operated by the Panama Railroad Company to the corporation created by the act, the vessels purchased or constructed to be of a type, so far as our foreign trade may permit, suitable for naval auxiliaries. The President is authorized to take them over for use as naval auxiliaries or for other purposes, and at a reasonable price of rental.

Powerful private interests are arrayed against this bill. The representatives of special privilege and the powerful organization known as the shipping trust, with its affiliations in the domestic and foreign trade, oppose it. They are vociferous in the expression of their fears that the passage of the bill will involve us in grave complications with the belligerents. They may be counted on to promote legislation when it is for their benefit and will increase their profits, but view with grave concern legislation for the general welfare. Another class opposes Government ownership, honestly believing it is not a proper function of the Government. The first class also takes advantages of the reasons urged by the latter to defeat this legislation. None of these classes has proposed a rational plan as a substitue for the Administration bill.

It is assumed that Government ownership is something new under the sun. Those who urge this objection assume that the American people are ignorant of the many activities of the Government in which the principle is applied. Private enterprise failed to build the Panama Canal, and the Government took over that great enterprise and has completed the canal in the interest of the world's commerce, and for the national defense. The Government owns and operates the Panama Railroad. It was relocated and rebuilt within the last five years at a cost of about ten millions of dollars; also owns and operates the Panama Railroad Steamship Company's fleet of passenger and freight steamers from New York to Panama, and has done so for eleven years past. The average rate of freight between New York and the Canal Zone at the time the Government took over the operation of the line was $8 per ton. This has been gradually reduced to the present rate of $3.50 per ton on rough goods and $4.50 per ton for general cargoes. The reductions made by the Government line similarly affected the rates by the other lines, all of which were of foreign registry. The result has been an immense saving to the Government in cost of construction of the canal, at the same time no complaint has been made that the reduced rates have not been remunerative to the foreign as well as the Government line.

The War Risk Insurance Bureau is a Government activity that has worked well. The rates are one eighth of one per cent. What they would be if the business was being done by private companies must be left to our imagination. The Government has a splendid fleet of vessels in the revenue cutter service under control of the Treasury Department. The successful and economic management of this fleet requires as high, if not higher order of skill and efficiency than is required in the management of a fleet of merchant vessels.

The Government, through the Post Office Department, has taken over a large part of the transportation business heretofore done by the express companies, and at a reduction of cost to the American people of about 50 per cent, and little heed would be paid to a demand to abolish the parcels post upon the ground that the Government should not engage in the transportation business.

The Government is building a railroad in Alaska at a cost of forty millions of dollars to unlock the mineral wealth of that great storehouse of nature for the benefit of all the people rather than have it exploited for the benefit of the few. It is to be hoped if the Government goes into the steamship business it will prove a greater success than has the operation of our railroads under private control, notably the New Haven under the Mellen *régime*.

The Government owns the greatest wireless system in the world, under the control of the Navy Department, which not only renders efficient service for all the departments of the Government, but does a large amount of commercial business at reasonable rates, and could do more without additional expense of operation. Yet it is assumed that the Government should not engage in the ownership and operation of shipping in the foreign trade to meet the demands of our growing and expanding foreign commerce, although private capital has failed for fifty years to provide such service for the American people.

The Washington *Post* of February 7th in an editorial very pertinently remarks: "Private capital knows full well that it can not and will not establish an American merchant marine without the aid of public cash contributed in some way, form, or manner by the Government. It is to the interests of foreign shipping combines that no American merchant marine be established. It is to the financial interests of powerful representatives in the country of foreign shipping—commercial and financial interests—that no American merchant marine be established unless they can control it, save their European allies from American competition, and make such rates for freight and passengers as will afford them large profits. They are entirely willing to draw financial aid from our Government if the control of the marine is given them."

Up to the European war our foreign commerce was in the grip of foreign shipping lines. These lines were controlled by shipping rings and competition for the most part had been eliminated. Rates had increased in the last few years 50 to 200 per cent. These combinations were so powerful in all the trade areas of the world that no independent ship lines dared to enter the field and compete with them.

Summary of the Most Striking Increases.

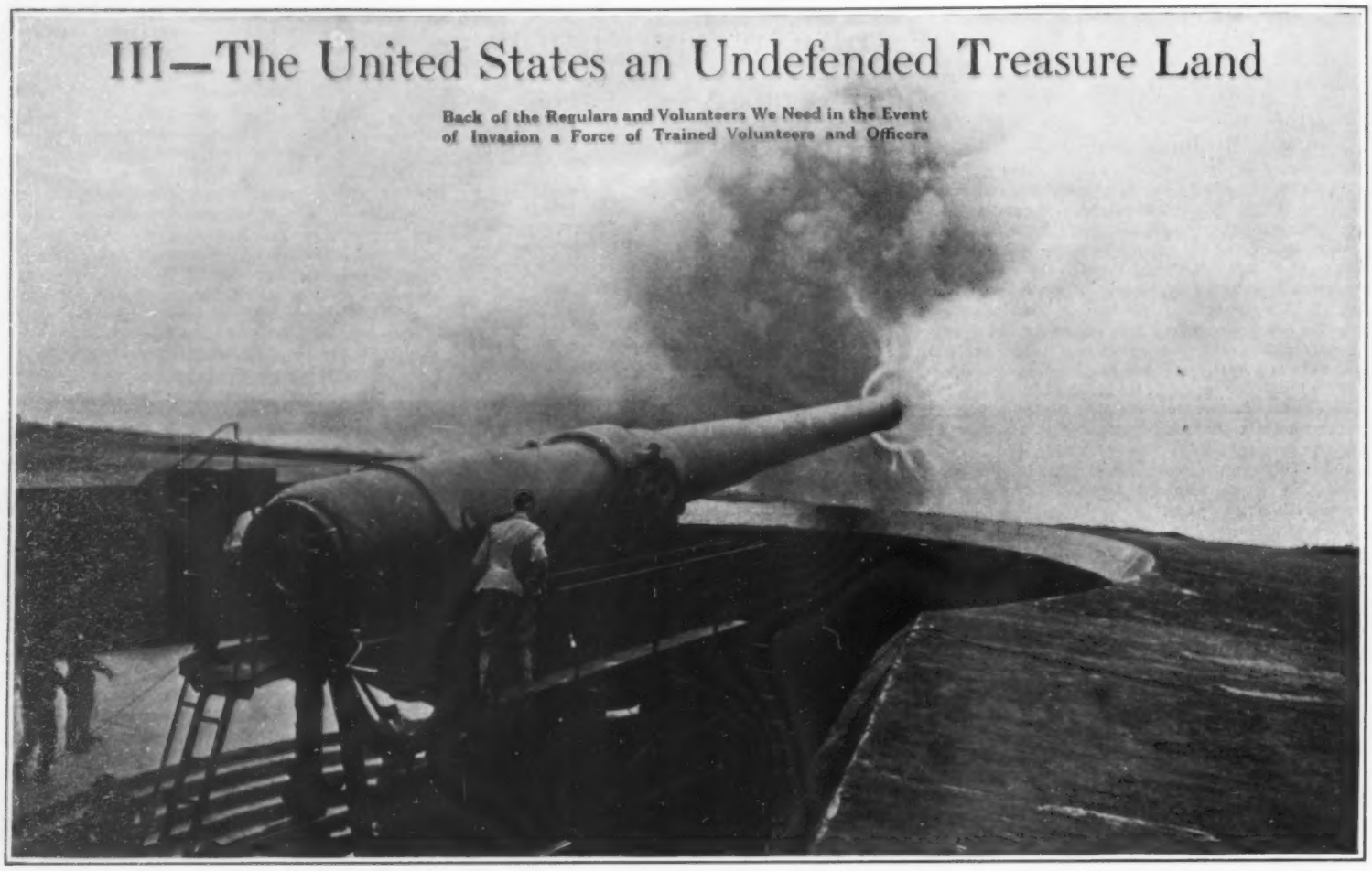
Since the outbreak of the war in Europe the following are striking illustrations of ocean freight rates:

Ocean freight rates on grain from New York to Rotterdam have been increased since the outbreak of the war 900 per cent; on flour, 500 per cent; on cotton, 700 per cent. From New York to Liverpool the rates on the same commodities have increased from 300 to 500 per

(*Concluded on page 185.*)

III—The United States an Undefended Treasure Land

Back of the Regulars and Volunteers We Need in the Event of Invasion a Force of Trained Volunteers and Officers



Discharge of a coast-defense 12-inch gun. Note flash of white-hot gas at the muzzle.

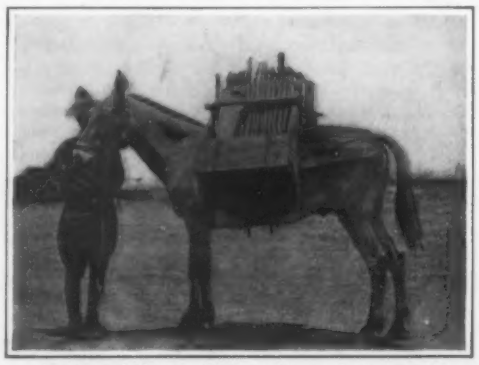
From President Washington to President Wilson, the Executive has persistently urged upon Congress the necessity of providing, in times of peace, a body of citizen soldiery properly trained and equipped, with which instantly to meet and repel any invasion of the United States. With equal persistency, Congress (except during periods of war) has refused to listen to the warnings of its President. To-day, because of this neglect, the United States, the richest of the rich countries of the world, is the most open to invasion. The ocean, once a barrier, now, thanks to steam navigation, offers a choice of half a hundred highways, by way of any one of which a first-class power might slip by our crippled or bottled-up fleet, which is now rapidly losing in relative strength and is without adequate personnel, necessary scout cruisers or submarines, and, within a week or ten days, land a fully equipped advance force of 200,000 highly-trained troops. To oppose this, the United States, in thirty days, could concentrate, at the most, 30,000 regulars and 60,000 militia.

The present series of articles is published with a view to bringing before the country at large and Congress in particular the true facts as regards the military defenselessness of the United States. The facts, as here given, are in the highest degree authoritative. They represent the alarming conditions and the remedy therefor, as presented, for many years past, in the annual reports made to the various Secretaries of War by the General Staff of the Army. What is Congress going to do about it?
—EDITOR.

IN addition to the reserve behind the regular army and militia, we must take up the question of building up a large force of volunteers, because, as already stated, the regular army and militia at war strength will furnish only about one third of the force which will be needed in case of war with a first-class power. No adequate measures have ever been taken to train or organize officers or men for volunteers. It is believed this can be done for the men and in part for the officers through a special form of enlistment, which will interfere as little as possible with the educational and industrial careers of those affected; and it has been suggested that training adequate in character could be secured through three annual periods of two months each. The men under training will be in camp for two months each summer for three years, and subject to an intensive training under the most carefully selected regular officers. Men completing the three periods should be held as volunteer reservists for a period of years, dependent upon the size of the class coming to training each year. All this sounds large and formidable, but it must be done if we are to be ready to meet the emergency which may be thrust upon us at any time. Even if we are unable to train a sufficient number of men for enlisted men of the volunteers, we must, in time of peace, train the necessary officers. This is absolutely essential, for it must be remembered that there will be no time to develop officers for volunteers; in fact, no means of developing them, once war is upon us. All regular and militia organizations and officers will be in the field and the training of volunteers will be conducted under conditions which make it almost impossible to train them. Thousands of officers must be trained in advance if the volunteers are to be even reasonably efficient in the early stages of the war.

During the period of their active service the officers and men must be enrolled in properly organized military units. They must be mobilized each year and their arms and equipment held at all times ready for immediate use. The number of volunteer troops which will be necessary to provide the required force, 460,000 mobile troops, including the regulars and the militia at war strength, will be about 135,000.

In addition to this force of volunteers it must be remembered that the General Staff in its plan of defense, as set forth in the Organization of the Land Forces, has recommended as necessary that 300,000 additional volunteers be at once raised. When it is remembered that the coastguard troops (that is to say, troops which will co-operate with the coast fortifications and without which the latter will be open to capture by land attack made by raiding parties from fleets) amount to nearly 400,000 for both coasts, about 275,000 for the Atlantic and Gulf seaboard, it will be seen that steps must be taken to provide the necessary officers and men for this force. Any increase which may be made in either the regular or militia establishment by adding new organizations will reduce by just so much the number of volunteers to be raised in the early stages of a war.



Engineer's intrenching outfit, packed on mule.

Any assumption that hundreds of thousands of volunteers are going to spring to arms in a condition of efficiency is most dangerous and wholly unjustified; in fact, such a responce would be literally impossible, and any dependence upon it is wholly unwarranted. This fact cannot be too strongly impressed upon the American people.

Above all else in importance in raising and organizing volunteers is the provision of an adequate number of officers—officers who are efficient and well trained. These we must provide in time of peace, even if we are unable to provide the enlisted force, that is to say, the men. Our plans for the mobilization and utilization of this volunteer force, the points of mobilization and area in which it is to operate, must all be worked out in great detail in time of peace, for any war in which we are engaged would probably be one of aggression on the part of our enemies, consequently the attack will come suddenly and at a time when the enemy is fully prepared. Knowing his own plans, he will bring against us the most thoroughly trained and equipped military organizations, fully prepared in every detail to attain his objective. To assume that equally good men, but untrained and without the necessary equipment and trained officers to lead them, would have any chance for success, is folly. Such an attitude on our part can only result in disasters and in the useless and unnecessary wasting of the lives of our people.

The Present Sources of Officers for Volunteers.

The present sources of officers for volunteers are the following: First, men who have had service in the regular army or militia and are still of an age fit to bear arms. Second, men who have graduated from military schools maintaining a course in military instruction under regular army officers. Third, approved graduates from the military instruction camps for college students. Fourth, men who have qualified for appointment as officers of volunteers through examination. All of these sources at present, with the exception of the graduates of the military schools, are limited.

Summer Camp Training of Officers.

It is hoped to greatly increase the number who will be available through training at the summer camps for college men. Last year there were about seven hundred students at these camps, and their record of performance was so excellent that there is every reason to believe these camps will be a most valuable source of supply for volunteer officers. In the first place, the men who attend these camps go because they are interested. This is shown by the fact that they pay their own ex-

penses. They receive five weeks of intensive training, during which they get about as many hours of actual work as the average militiaman does during an average enlistment.

In Case of Invasion We Should Require 30,000 Volunteer Officers. Major-General Wood's Plan.

The magnitude of the task in training volunteer officers is apparent when it is realized that it will be necessary to develop not less than 25,000 in case we should have to mobilize enough additional volunteers to bring our total force up to 1,000,000 men. It has been recommended by Major-General Wood for a number of years that five hundred selected graduates of colleges maintaining military instruction under officers of the army

Soldiers at meal, Fort Crockett, Galveston, Texas.

be appointed provisional second lieutenants for one year and that they receive full pay and allowance of a second lieutenant, amounting to about $1,750 in money and valued at approximately $500 in allowances, each young man to be appointed subject only to physical examination, as they will be graduates of institutions of high standing. This number should be increased to 1,000. This procedure if adopted will give us a thoroughly well trained reserve officer, a man who has had from two to four years of military training at a college or technical school under the direction of an officer of the army, plus one year of actual service in the regular army. As the line of the regular army is always short about seven hundred to eight hundred officers, incident to detached service of various kinds, and this without in any way fully meeting the demands upon it for officers, it will be seen that these young officers will be of real value during their year of service. The cost to the Government will be comparatively little. The young men themselves will be able to leave the service with from $600 to $800 and should be held as reserve officers for from eight to ten years with the understanding that they will be called to duty only in case of war and for brief periods of training a few days each year. This would give us a steady annual increment of well-trained reserve officers, and these, taken in connection with the men who are qualified at the summer camps and through special means of examination, would eventually give us a reasonable reserve of officers for volunteers.

During Civil War Congress Made Land Grants to Encourage Military Training in State Colleges.

In the early days of the Civil War, Congress passed an Act, known as the Morell Act, which made grants of public lands to various State colleges, known as agricultural and mechanical colleges, and provided that military instructions would be maintained at these colleges. These grants have been of great value to the colleges, and some of them have maintained a rather effective course in military instruction. Others have simply kept up a nominal amount of work. The instruction at all these colleges should be standardized, so that the Government may know exactly the qualifications, so far as military knowledge goes, of the graduates, and an attempt should be made to secure legislation which will hold those graduates who have demonstrated fitness through practical work for a number of years as reserve officers and non-commissioned officers. This is not unreasonable in view of the educational facilities and advantages extended to the students at these institutions. A return in the form of service for six to eight years as volunteer reserve officers would seem but just and equitable.

The Early Presidents, Beginning With General Washington, Strongly Advocated Peace-time Preparation for War.

The necessity for the preparation for possible war was recognized by the early Presidents in various messages, but, little by little, interest in the subject of preparedness seems to have disappeared.

Thus, from Washington's first annual address we quote the following:

"Among the many interesting objects which will engage your attention, that of providing for the common defense will merit particular regard. To be prepared for war is one of the most effectual means of preserving peace. A free people ought not only to be armed, but disciplined; to which end a uniform and well-digested plan is requisite; and their safety and interest require that they should promote such manufactures as tend to render them independent of others for essential, particularly military supplies."

From his third annual message (speaking of the militia):

"This is certainly an object of primary importance, whether viewed in reference to the national security, to the satisfaction of the community, or to the preservation of order. In connection with this the establishment of competent magazines and arsenals and the fortification of such places as are peculiarly important and valuable naturally present themselves to consideration. The safety of the United States, under divine protection, ought to rest on the basis of systematic and solid arrangements exposed as little as possible to the hazards of fortuitous circumstances."

From his fifth annual address:

"I cannot recommend to your notice measures for the fulfillment of our duties to the rest of the world without again pressing upon you the necessity of placing ourselves in a condition of complete defense and of exacting from them the fulfillment of their duties toward us. The United States ought not to indulge a persuasion that, contrary to the order of human events, they will forever keep at a distance those painful appeals to arms with which the history of every other nation abounds. There is a rank due to the United States among nations which will be withheld if not absolutely lost by the reputation of weakness. If we desire to avoid insult we must be able to repel it; if we desire to secure peace, one of the most powerful instruments of our rising prosperity, it must be known that we are at all times ready for war."

From his eighth annual address, speaking of the country's inability to protect its foreign commerce:

"Will it not then be advisable to begin without delay to provide and lay up materials for the building and equipping of ships of war and to proceed in the work by degrees in proportion as our resources shall render it practicable without inconvenience, so that a future war of Europe may not find our commerce in the same unprotected state in which it was found during the present."

John Adams Said: "An Efficient Preparation for War Can Alone Secure Peace."

From John Adams's special message:

"With a view and as a measure which even in time of universal peace ought not to be neglected, I recommend to your consideration a revision of the laws for organizing, arming, and disciplining the militia, to render that natural and safe defense of the country efficacious."

From his second annual message (message dealing with the relations with France):

"But in demonstrating by our conduct that we do not fear war in the necessary protection of our rights and honor, we should give no room to infer that we abandon the desire of peace. An efficient preparation for war can alone secure peace. . . .

"We ought, without loss of time, to lay the foundations for that increase of our navy to a size sufficient to guard our coasts and protect our trade."

Thomas Jefferson Advocated Compulsory Service.

Jefferson in his fifth annual message advocated:

"The organization of 300,000 able-bodied men between the ages of 18 and 26 for offense or defense at any time or at any place where they may be wanted."

In a letter to Monroe he advocated compulsory service.

"We must train and classify the whole of our male citizens," he said, "and make military instruction a part of collegiate education. We can never be safe until this is done."

From his eighth annual message:

"If war be forced upon us in spite of our long and vain appeals to the justice of nations, rapid and vigorous movement at the outset will go far toward securing us in its course and issue, and toward throwing its burdens on those who render necessary the respect from reason to force. . . .

"Considering the conditions of the times in which we live, our attention should unremittingly be fixed on the safety of our country. For a people who are free and who mean to remain so, a well organized and armed militia is their best security."

President Wilson on the Need for the War-training of Our Citizens.

"It will be right enough, right American policy, based upon our accustomed principles and practises, to provide a system by which every citizen who will volunteer for the training may be made familiar with the use of modern arms, the rudiments of drill and maneuver, and the maintenance and sanitation of camps.

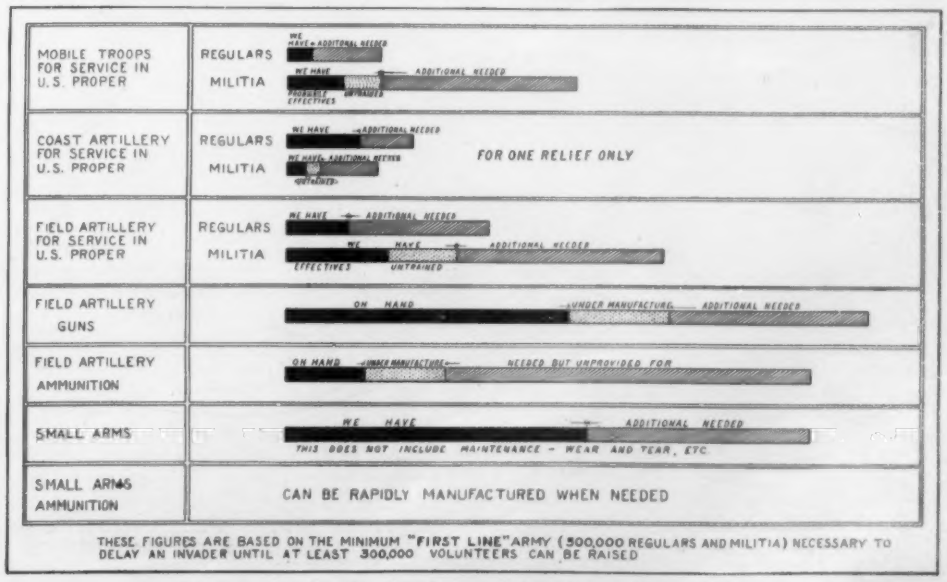
"We should encourage such training and make it a means of discipline which our young men will learn to value. It is right that we should provide it not only, but that we should make it as attractive as possible, and so induce our young men to undergo it at such times as they can demand a little freedom and can seek the physical development they need, for mere health's sake, if for nothing more."

Small Leaks

WE are often admonished to take care of small leaks—to keep faucets tight because the loss incident to a small leak runs up into a considerable sum.

Now, it may be of interest to know just what the water loss would be from a leaking faucet. Let us assume that a faucet leaks to the extent of allowing the escape of two drops of water per second. In one month the leakage would amount to a little over 84 gallons. With water at 25 cents a thousand gallons, the money loss per month would be about 2 cents. Should the leak be in a hot-water faucet, the loss would be greatly increased because of the fuel required to heat the water. With coal at $5 a ton, burned with the efficiency usually attainable under domestic conditions, the loss in water and heat in the above example would be nearly 10 cents a month.

The fact that the loss is small should not allow us to neglect small leaks, because, by disregarding them we tend to become slovenly in all things. Furthermore, small leaks do not remain small. The constant leakage of faucets wears small passages through the seats and makes tightness impossible. The next thing then is a new faucet with the accompanying plumber's bill, which is notoriously not small.


MOBILE TROOPS FOR SERVICE IN U.S. PROPER
REGULARS
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FIELD ARTILLERY FOR SERVICE IN U.S. PROPER
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FIELD ARTILLERY GUNS
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FIELD ARTILLERY AMMUNITION
ON HAND
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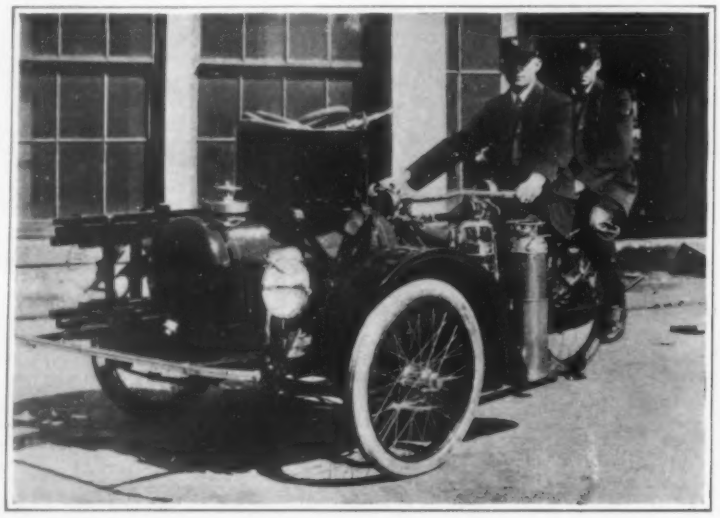
NEEDED BUT UNPROVIDED FOR
SMALL ARMS
WE HAVE
ADDITIONAL NEEDED
THIS DOES NOT INCLUDE MAINTENANCE - WEAR AND TEAR, ETC.
SMALL ARMS AMMUNITION
CAN BE RAPIDLY MANUFACTURED WHEN NEEDED
THESE FIGURES ARE BASED ON THE MINIMUM "FIRST LINE" ARMY (500,000 REGULARS AND MILITIA) NECESSARY TO DELAY AN INVADER UNTIL AT LEAST 300,000 VOLUNTEERS CAN BE RAISED

Diagram showing the alarming condition of our military defenses.

Chemical Engine on the Tri-car

A THREE-WHEELED fire engine of light weight, low cost, and high efficiency has been developed recently. It is good for a speed of 45 miles an hour, carrying two firemen and a complete chemical equipment, a reel of hose, a 12-foot ladder and all that is required for subduing a blaze before it has made a disastrous start. In short, it is a light scout car in the never-ending warfare against fire, which may be used as an auxiliary to the heavier and more costly fire apparatus. It is also serviceable in small, but scattered communities, which cannot afford the larger engines. Its low cost, small size (making an expensive fire house unnecessary), and its small upkeep charges adapt it particularly for a small village.



A motorcycle chemical engine.

Who Will Rescue the Lost Explorers?

AT this moment it is probable that three, and possible that eleven, of the men who constituted the Canadian Arctic Expedition of 1913 are spending the sunless days of the polar winter under conditions of peculiar hardship, hoping against hope that the still distant summer will bring them salvation. Up to the present time it is doubtful whether the rest of mankind will make any serious effort to realize this hope.

It will be recalled that when the "Karluk" was crushed in the ice north of Siberia her crew became divided into three parties. One party, comprising four men, under First Officer Anderson, left the scene of the shipwreck January 21st, 1914, well equipped and provisioned for three months, headed for Herald Island, which had been mistaken for Wrangel Island. A supporting party left them a few days later, halted by open water some three miles from this land, since which time they have never been heard from. Whether they succeeded in reaching Herald Island or were carried by drifting ice to some other part of the Arctic Ocean is unknown. On February 7th four more men, viz., Dr. Forbes Mackay, the surgeon; James Murray, the oceanographer; Henri Beuchat, the anthropologist; and Seaman Morris, also equipped with sledges, food, and ammunition, left the main party in an effort to reach land. Their fate remains equally problematical. The rest of the crew ultimately reached Wrangel Island, where three of them died and the remainder, except Capt. Bartlett and an Eskimo companion, who pushed on to the continent, survived until a relief expedition reached them last September.

Meanwhile, in another part of the Arctic Basin, the leader of the expedition, Stefansson, embarked upon a perilous sledging expedition over the sea ice from Martin Point, Alaska, in the hope of reaching unknown lands to the north. On April 6th, 1914, a supporting party left him with two companions, Storkersen and O. Anderson, a sledge, six dogs, and a good supply of food and ammunition, at the edge of the Continental Shelf. He then hoped to return in a few weeks to Alaska or to gain the shores of Banks Land. It is nearly certain, however, that he was carried westward on the drifting ice, and, if he is still alive, he is now probably somewhere north of Siberia. He is an experienced and resourceful Arctic traveler, and was not at least in much danger of starvation, as game was abundant.

It is an unprecedented situation in the history of polar exploration that no plans for seeking these lost explorers have, as yet, definitely materialized. The "Karluk" survivors on Wrangel Island were rescued last season by one of the three ships, all flying the American flag, which went in search of them. No relief expedition was sent out by the Canadian government. Neither is there any movement on foot in Canada to rescue Stefánsson and his two companions, or to undertake the admittedly less promising quest of the eight men last heard from near Herald Island. The most hopeful feature of the situation that has yet developed is the recent project of the Aero Club of America to utilize aeroplanes, in conjunction with a suitable steamer, for the dual purpose of seeking the lost explorers and clearing up some of the mysteries of Arctic geography. It ought not to be difficult to raise the relatively small sum needed for this humane and scientific undertaking.

A Model Testing Laboratory.—The new testing laboratory of the Pennsylvania Railroad, at Altoona, is, as might be expected, a model plant, and there is at least one novelty in the construction of the building, apart from the outfit, that will be watched with interest. The floors are an experiment, having been constructed on a new plan which is said to have originated in Greece. On a five-inch layer of sawdust is placed a half inch layer of a special cement, and this construction is expected not only to deaden sound, but to be easier and more comfortable for the workers who have to stand for long periods. Among the apparatus installed is a machine capable of exerting a pressure of one million pounds, which can also be used for testing couplers and heavy material. There are also machines for testing brakes, steel bars and many other forms and classes of material. There is also a well-equipped electrical testing department, and a department for the storage and examination of explosives that has walls of concrete two feet thick. The new building will greatly facilitate the work in various lines of investigation.

Some Spectacular Illuminating Effects at the Pan-Pacific Exposition

AT all of the large expositions, beginning with Chicago in 1893, electric illuminating effects have been specially featured, and at the Pan-Pacific Exposition, at San Francisco, special attention has been given to this effective method of lending attraction to the night scenes around the grounds, advantage being taken of many new ideas and modern improvements in apparatus to add to the picturesque impressions of the surroundings. Many special effects will be seen in connection with the different buildings, but one of the most striking and attractive will be the illumination of the immense glass dome of the Palace of Horticulture, which, surrounded by its picturesque setting of foliage, will, after dark, be a veritable kaleidoscope of changing colors.

The dome of this building is 186 feet high and 154 feet in diameter, the immense hemisphere of which above the body of the building is set entirely in glass of a slightly greenish tinge that will produce a harmonious effect with its surroundings during the day. In the center of the main floor of the building under the dome, and screened by encircling palms and decorative shrubbery, is located the electric illuminating apparatus, consisting of twelve great searchlights, each 30 inches in diameter, all directed upward to a central point, and said to produce 25,000,000 candle-power of total light. Within this circle of lights is placed a framework 15 feet high that carries the apparatus for diffusing and directing the light projected by the lamps, and the mechanism for producing the varied color effects. At the top of the framework is placed the diffusing device *C*, which is a plate of clear glass five feet in diameter and one quarter of an inch thick, that has a number of small circular plano-convex diffusing lenses cemented to its upper face, the whole forming a composite diffusing lens for evenly distributing the light over the glass surface of the dome. Immediately beneath the lens plate, and parallel with it, is located the color screen made up of three pairs of sectors of glass colored, respectively, yellow, blue, and red, the sectors of the same color being located opposite each other. This color screen is supported by a shaft which is arranged to be turned by an electric motor. Beneath the color screen, and mounted on a hollow vertical shaft, within which the screen shaft revolves, are a pair of opaque sectors, shown at *B* in the small sketch. The color screen and the opaque obscuring sectors both revolve in the same direction, but the screen makes one more revolution per minute than the sector vanes, with the result that the complete cycle of color effects will be produced each minute.

Of course the three foundation colors, yellow, blue, and red are shown at each revolution of the color apparatus, but as the opaque vanes pass from one color sector to the next there is an overlapping and mixing of the two adjoining colors, producing an entirely new series of tints. Thus, when the vane passes from the yellow to the blue portions of the screen the mixed lights produce a green tint that varies in depth according to the proportions of the two colors as the vane shifts, the tints gradually dissolving one color into the other. In the same way varying tints of purple are produced by the mixing of the blue and red, and oranges by the red and yellow mixtures. This succession of plain and mixed colors produces remarkably varied effects; and as the color varying apparatus revolves at considerable speed the play of colors is continuous and wonderful. It may also be noted that the rapid revolution of the color apparatus gives the effect of a continuous illumination of the entire dome, instead of lighting consecutive sections, as would result from a slow movement. The effect of the diffusing plate, or lens, described above is shown in the diagram, where the shaded section *B* shows the course of the beam from a single light when no diffusing lens is used, and the section marked *A* shows how the lens spreads and diffuses the beam over a great area. The lens plate described is the one that will be generally used, but four other plates, each producing a special effect, have been provided. One of these special plates will produce horizontal bars of light; another rapidly changing spots, a third gives a wriggling effect; while the fourth produces whirling rings of varying colors.

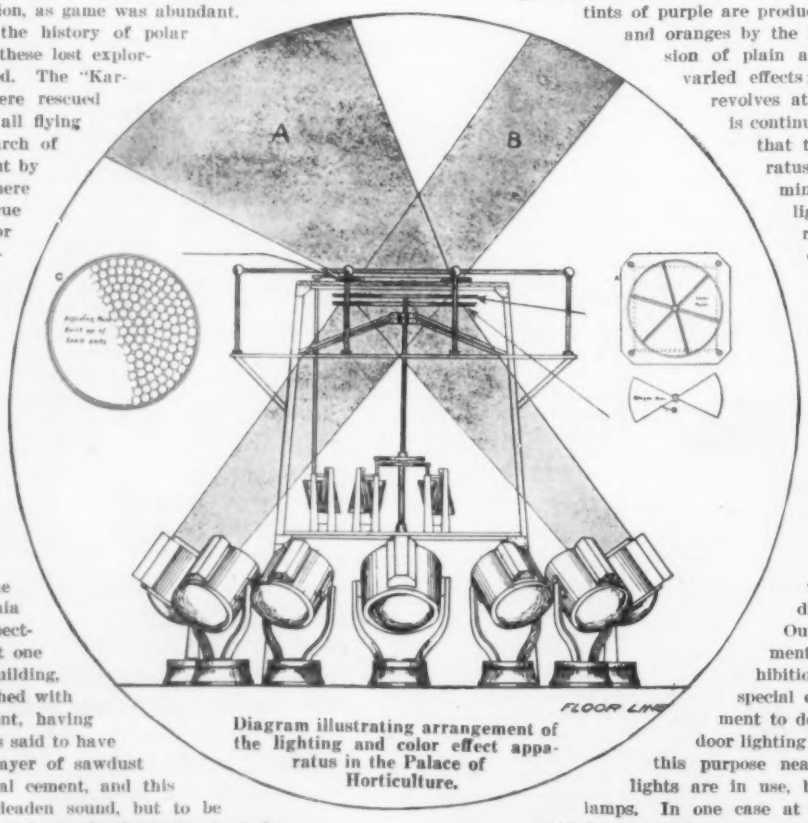


Diagram illustrating arrangement of the lighting and color effect apparatus in the Palace of Horticulture.

Outside of the buildings of the amusement concessions few of the regular exhibition buildings will be open at night, so special efforts have been made by the management to develop new and pleasing effects in outdoor lighting to make the grounds attractive, and for this purpose nearly four hundred high-power searchlights are in use, besides great numbers of incandescent lamps. In one case at least elaborate inside illumination is provided somewhat on the principle used in the Palace of Horticulture, described above. The Festival Hall contains a large auditorium with a dome ceiling having a radius of about 68 feet, and painted in light colors. In a pit in the floor of the auditorium are placed ten large projectors, the light from which passes through, and is diffused by a plate of ground glass placed in the opening in the floor. This diffused light is again diffused and reflected by the domed ceiling, but, of course, is not visible from without.

The Tower of Jewels, with its beautiful decorations, will be a center of the illumin-

ating effects, but nothing on the grounds can vie with the gorgeous color display of the Palace of Horticulture. The lighting effects at the exposition were in charge of W. d'A. Ryan of the General Electric Company, as chief engineer of illumination, and many of the unique and original features are due to his skill and ingenuity.

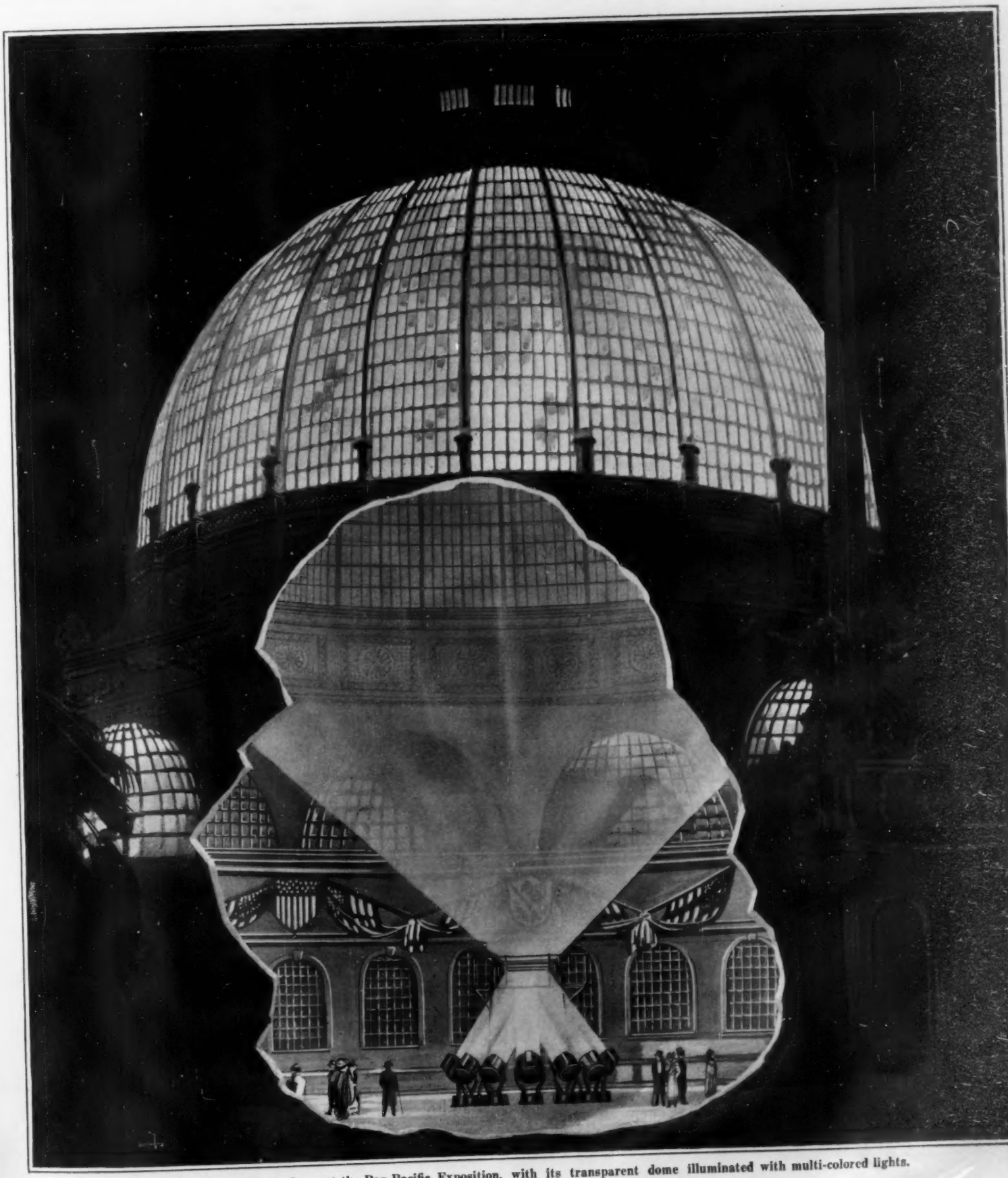
The Pan-American Scientific Congress

AT a time when scientific solidarity has been so seriously impaired in the Old World as a result of the European war it is gratifying to note that preparations are afoot for bringing the scientific men of the New into closer and more friendly relations. The first much-needed step in this direction was taken at the end of the year 1908, when the first Pan-American Scientific Congress assembled at Santiago, Chile. The second congress is to meet in Washington next October, and the plans for it have been formulated by a committee headed by Mr. William Phillips, Third Assistant Secretary of State, the other members being the Director General of the Pan-American Union; the U. S. Commissioner of Education; the Surgeon General of the U. S. Army; Mr. G. M. Rommel of the Department of Agriculture; Mr. William H. Holmes of the Smithsonian Institution; Prof. L. S. Rowe, University of Pennsylvania; and Dr. J. B. Scott of the Carnegie Peace Endowment.

The congress is to be organized in eight sections, as follows: 1. Anthropology. 2. Astronomy, meteorology, and seismology. 3. Conservation of natural resources; agriculture; irrigation and forestry. 4. Education. 5. Engineering, transportation, and commerce. 6. International law, public law, and jurisprudence. 7. Mining and metallurgy, economic geology, and applied chemistry. 8. Public health, medicine.

If the history of the last congress repeats itself, the forthcoming meeting will be an event of exceptional interest, from both a scientific and a political point of view. At Santiago delegations attended from eight North and Central American countries, including the United States, and from nine South American countries, and an imposing list of papers was presented, more than fifty of which emanated from this country. The President of Chile attended the opening session, held an official reception for the delegates, and entertained all of the latter at dinner, a limited number being invited each day during the congress. Other entertainments, official and unofficial, were overwhelming in number.

Britain's Gasoline Problem.—According to an official British statement, America sent 17,000,000 gallons more gasoline in 1914 than in the previous year, but to offset this increase no imports were received since September, 1914, from Russia, Roumania and the Far East, except about 5,000,000 gallons, which compared with the demand of 460,000,000 gallons in the United Kingdom is but a drop in the bucket. In discussing this situation the leading British motor magazine says: "American supplies alone have prevented a famine in gasoline.



The Palace of Horticulture at the Pan-Pacific Exposition, with its transparent dome illuminated with multi-colored lights.

How Epidemics are Fought in the Austrian Army

By the Berlin Correspondent of the Scientific American

DISEASE, as our readers know, is a foe even more dreadful in war than the enemy's shells and bullets, and one of the most important tasks of modern warfare consists in improving as far as possible the sanitary conditions of an army. Alarming rumors were spread, at the beginning of this war, as to the dysentery and cholera epidemics which, it was said, wrought great havoc in the Austrian army and threatened to become a real danger to soldiers and civilians alike.

The present writer has had occasion recently to discuss the matter with somebody just returned from the Galician part of the theater of war, who thus was in a position to judge how matters actually stood. "The danger," he said, "has been definitely averted, thanks to the energetic measures taken at the very outset by the Austro-Hungarian military authorities. In fact, the cholera epidemic has never been allowed to spread beyond its original focus. Through the courtesy of the army authorities, I have been authorized to take a few photos which strikingly show the comprehensive measures taken to fight the epidemic."

The first thing done to check cholera as well as dysentery was to install in the towns and villages of Galicia long rows of barrels containing sterilized water, which the soldiers alone are allowed to use. Another effective measure consists of sprinkling the floor of railway stations with carbolate of lime and washing it frequently. Cholera patients are, of course, housed in isolated barracks, each of which is surrounded by a lime ditch. Special stretchers are used for the transport of dysentery and cholera patients.

The Meat Supply of the United States

THAT the nation faces a serious situation in the matter of meat supply is the disquieting statement of the Secretary of Agriculture in his annual report, and this condition is especially portentous when we consider the constantly increasing demand for our products that must come from Europe for many years. "Just what factors have brought this situation about no one can define with certainty," says the Secretary; and he disposes of the matter by the truly American method, of "appointing a committee."

There are, however, he points out, some directions in which efforts may be made with a view to inducing additional supplies; but the argument is difficult to reconcile in some cases. For instance, the secretary says: "It is evident that we have been considering the meat supply of the nation too exclusively in terms of the big ranch," and he immediately goes on to say, "Obviously it is important that we continue to assist in further developing the big ranch."

The directions in which the secretary sees hope for an increase in our meat supplies are: First, in a more satisfactory handling of the public grazing lands; second, in systematic attention to the production of beef animals in the settled farming areas of the country, particularly in the South; third, in increased attention to the smaller animals, such as swine and poultry; and fourth, in the control and eradication of the cattle tick, hog cholera, tuberculosis, and other animal diseases and pests.

In relation to the first point it is stated that the present methods of transforming the grasses of the public grazing lands into beef and mutton are generally conceded to be wasteful, and it is estimated that, under a proper system, the quantity of beef and mutton produced on these lands could be increased at least 50 per cent. There are about 300,000,000 acres in these lands, upon which any person can graze any amount of stock at any time; and from some remarks in the report the inference may be drawn that the grazing value of these lands has been impaired. No other result could be expected where no provision is made for the protection of the land, and there is every inducement for the casual user to get all he can out of the land in the shortest possible time. The natural result is that in this time of need little relief can be counted on from this source.

The second and third propositions would seem to hold out considerable hope, until it is recalled that in former times every farmer made it a point to raise some kind of meat product every year until conditions became such that he could not do so with the expectation of any profit; and there is no reason to suppose these conditions have changed in recent years.

There appears to be a useful field of effort in the eradication of diseases, when we consider that out of 57,000,000 animals inspected in the past year 533,000 were found to be infected with tuberculosis, and that hog cholera and cattle tick have cost the producers of this country anywhere from one hundred to one hundred and fifty million dollars in a single year.

Whatever the causes of the shortage in the meat supply it will require something more than perfunctory reports to prevent prices from going beyond the reach of the average wage earner, and that at no distant date.

Lime ditches surrounding barracks in which cholera patients are housed.

Barrel of sterilized water for Austrian soldiers in Galicia.

Applying Power to a Canoe

THE craving for speed and the modern disinclination to do anything that can be avoided by the expenditure of money has overtaken the canoe, the most delightful and romantic water craft that has ever been devised, for now a method has been developed for fitting a gasoline engine to the fairy boat and the poetic paddle is to be laid aside. For several years an ingenious and compact little motor set has been in use for propelling rowboats, that can be quickly attached to the stern of any boat, and a number of concerns are now producing outfits that are justly popular and undoubtedly useful; but the shape of the usual canoe has made it not altogether convenient to attach one of these motors, which are portable and secured by an adjustable clamp. Now, however, some inventive mind has conceived the idea of building a well in the body of a canoe, having an opening in the bottom and watertight sides, in which one of these little motors can be placed and conveniently attached. When thus fitted the motor shaft extends down through the opening in the well and carries the propeller beneath the bottom of the canoe, as shown in the illustration. Undoubtedly this scheme will provide quite a speedy conveyance that will cover considerable distances without loss of time; but the devotee of the silent paddle and of reposeful idling in the primitive canoe will hardly recognize his favorite craft in its new guise.

Detachable power plant for a canoe.

Experiments in Hybridizing Flowers

AN article of great interest to botanists is that which describes a series of experiments in hybridizing Japanese flowers, conducted by Dr. Walter Proctor Jenney, and published in the issue of the SCIENTIFIC AMERICAN SUPPLEMENT of January 9th, No. 2036. The cause that led to the experiments was the discovery that *the dry pollen of the white moonflower, applied to the stigma of the morning glory, is inert and will not fertilize the ovary, unless the pollen be wet with the dew-like fluid excreted upon the surface of the stigma of the moonflower.*

As a result of this discovery the writer undertook a series of experiments, using the white moonflower and both common and Japanese morning glory, and following methods that departed widely from the usual procedure and which produced some exceptional results. Some of the conclusions resulting from the experiments, which extended over several years, are that hybrids of the Japanese morning glory with the white moonflower seem not to be subject to the operation of Mendel's law or are only subject to it in a limited way; this may be owing to the fact:

1. That, for some reason, the white moonflower is immune from the influence causing the seedlings of hybrid plants to vary in the second year. In this connection it is worthy of note that crosses of the Japanese and American morning glory, arising from pollenation by insects, follow Mendel's law.

2. That this exemption is due to some quality or property of the fluid excreted by the stigma of the moonflower.

A full appreciation of these interesting experiments can be had only by reading the complete article, as above noted.

The Current Supplement

THE current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2042, for February 20th, 1915, has a decided war flavor, although it contains an unusual variety of specially valuable matter. The article on X-Ray Work in the War tells us something about the use of this valuable agency as applied by the German army in field and hospital. Auxiliary Motor Cars describes special types of cars that have been developed to meet the various necessities of an army. The Making of Large Guns gives some timely details of how these weapons are made that will be acceptable to everybody. High Explosives in Warfare is one of those clearly written articles by an authority that tells just what we all want to know about an important question. Aeronautics and the War reviews general conditions and what has been done so far by the flyers, and also reviews the developments of the year. Aeroplane Darts and Fire Darts describes some novel implements of destruction developed by the war. In contrast with the above matter the article on Training for Municipal Service tells why municipal government in Germany is usually so efficient and business-like and also tells something of the work now being done in America with the same objects in view. Uniformity in Dosage of Radium Emanations discusses a therapeutic agent that is assuming considerable importance. Philosophy and Technics is an interesting metaphysical discussion of the relations of theoretical study and practical application. The Chemistry of the Flaming Arc gives much valuable information in relation to an important practical subject. Causes of Solar Heat discusses various hypotheses to explain how the sun continues for ages to emit substantially the same quantity of heat. The paper on the treatment of gas from blast furnaces is continued, and there are also articles on Instantaneous Photography Without a Camera; Thinking Animals; Wireless Telephony; The Effects of War on Crime, and notes on new and useful books.

Canadian Electricity for Canadians.—A great deal of electricity generated along the Canadian border is used in the United States. Recently the Canadian government has declared itself as opposed to the export of such natural resources when the industries of Canada develop to such an extent that they could use the whole of the energy produced, and has stated that contracts to export energy from Canada to the United States may be revoked at any time.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

RETAINING DEVICE FOR SHOE LACES.—ANNIE H. COHEN, care of Hebrew Orphan Asylum, 137th St. and Amsterdam Ave., New York, N. Y. This device is arranged to securely hold the end portions and tips of the lace securely in place, at the same time dispensing with tying the lace ends into bows or knots and preventing accidental untying or loosening of the shoe lace.

SHOE FASTENING.—FREDERICK DASSORI, 1135 84th St., Brooklyn, N. Y., N. Y. The invention provides means for closing the instep opening or side opening of shoes without requiring the use of laces or buttons; provides a fastening means for shoes made of a single piece of leather or similar material, which is crimped to close the meeting edges of the foot opening in the shoe, said fastener being connected at its opposite edges near the opening in the shoe, and a single fastening device being utilized for connecting the upper edge of the fastener or tongue; and provides a crimped leather tongue to be connected at its opposite edges to the shoe upper upon opposite sides of the meeting edges of the foot opening, said tongue tending to close the opening, and a device for holding the shoe in closed condition about the foot of the wearer.

TROUSERS.—A. A. BROWN, 4 Washington Place, New York, N. Y. The invention relates to alterable ready-made trousers and has to deal more especially with the waist construction whereby the trousers can be readily and quickly altered as to the waist measurements without requiring any special skill or necessitating the piecing out of the waistband lining and stiffening strips.

UNION GARMENT.—R. L. MARGOYLES, 69 Wooster St., New York, N. Y. The invention provides a suit having an opening in the rear, the body of the garment adjacent the opening being adapted to yield laterally to obviate the necessity of pulling different parts of the garment trying to enlarge the said opening when in need of using the same.

Pertaining to Aviation.

STABILIZING MEANS FOR AEROPLANES.—J. R. JUNKIN, Box 737, Fairbanks, Alaska. An object here is to provide means for automatically maintaining an aeroplane in horizontal position and at the same time having means for permitting the tipping of the aeroplane at such times as it is desirable to have it tipped, as for instance in turning corners.

Electrical Devices.

ELECTRIC CORD PLUG.—T. F. CLARK, 18th St. and Willow Ave., West Hoboken, N. J. The invention deals more particularly with detachable connectors whereby an electric light or other current consuming device can be readily attached to or detached from a lamp or wall socket or equivalent means connected with an electric supply circuit.

GATE VALVE SIGNAL.—L. A. GRIMES, 97 Dey St., Orange, N. J. This invention refers to automatic sprinkler systems and has particular reference to a means for giving a signal at headquarters or at any central station to the effect that some valve in the water distribution system has been moved or tampered with. It provides an electrical contact device for easy and quick application to standard gate valves now in common use.

Of Interest to Farmers.

CONVEYER.—N. BRIGHAM, Whitewood, S. D. This improvement has reference more particularly to conveying means for beet harvesters, which means are adapted to pick up beets after the same have been rooted out of the ground by the plows of the harvester and to convey them to a proper place.

HARROW.—R. L. BOEHNE, Hanson, Neb. This invention relates more particularly to means for taking apart the different sections of the harrow and reassembling the same in compact form so that the harrow as a whole is in suitable condition to be conveyed from place to

HARROW.

place. The harrow is of a knockdown construction, including a frame and a number of harrow sections, so arranged that the sections, or some of them, may be detached from the frame and again connected therewith, so as to occupy changed positions relatively to the same.

SWEEP RAKE.—J. J. BOLLERUP, Naponee, Neb. This inventor provides a rake in which teeth of a novel form are so arranged in connection with associated elements as to constitute gathering tines at their forward ends, and constitute at their rear ends a carrying rack on which the running wheels are directly mounted.

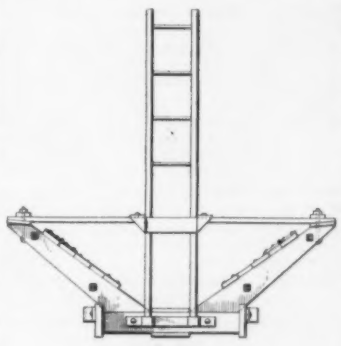
PLANTER.—W. W. HARRIS, Spartanburg, S. C. In the present patent the invention has for its object the provision of a planter with means for mounting a seed distributing wheel in a slot in the bottom of a hopper member so that the seed distributing wheel may be quickly removed.

TRAP NEST.—S. E. ELLIOTT. Address Allen C. Walker, Albion Nat. Bank Bldg., Albion, Ill. The nest is so arranged that the entrance of a fowl to the nest will close one entrance and open another, so that a record may be kept of the various fowls, the arrangement being such that when the fowl has left the nest the parts will return to their original position.

PLOW.—W. A. HART, Box 144, Cocoa, Fla. The plow is especially designed for use in cutting plants beneath the surface of the ground, in order to destroy the plants without disturbing the ground to any great extent and wherein the device is also adapted for ordinary purposes of cultivation.

NURSING PAIL.—E. THIEL, Box 5, Medford, Wis. The object here is to provide a nursing pail more especially designed for nursing calves, colts, and other animals, and arranged to insure proper feeding of the animal without danger of inducing colic or other afflictions by too rapid incorrect feeding.

HAY RACK.—I. L. OSBORNE, Redmond, Ore. The purpose in this case is to provide a combination rack capable of being expanded into sack form or contracted into compact form for handling or storing, and wherein the rack may

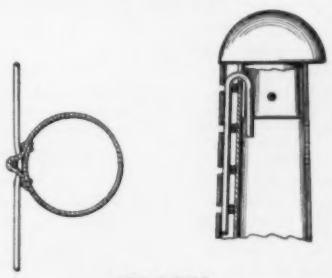


HAY RACK.

be converted into a rack for supporting hay, straw, or the like, or into a crate or cage for conveying live stock, as, for instance, hogs, sheep, calves, or the like.

Of General Interest.

FENCE POST.—W. J. FAUNT, P. O. Box 105, Sausalito, Cal. Mr. Faunt's invention is an improvement in fence posts of the metallic type, and his object is the provision of a simple, inexpensive post adapted for holding any number of wires, and wherein the holding



FENCE POST.

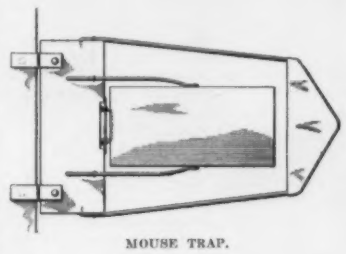
means is concealed and covered to prevent tampering therewith. The post is preferably of sheet steel, galvanized to prevent oxidization, and the steel will be of a thickness depending upon the conditions to be met. The joints are also preferably brazed, and the post may be cast instead of bent to shape.

METHOD OF COLORED PHOTOGRAPHIC REPRODUCTION.—J. LEWISOHN, 88 Fifth Ave., Manhattan, N. Y., N. Y. The process can be used with only two, or with more than three colors if desired. The principle consists in forming a series of superposing blue images, of which the preceding blue color of the image has been substituted by another color before the succeeding blue image has been formed.

HORSE COLLAR.—H. J. DANIEL, Sutherlin, Va. The invention is an improvement in combined hames and shoulder pads and relates particularly to means for connecting them and also to pad attachments of the same. The hames are provided on the outer side with the usual rein guides, and at a lower point with other guides. The upper ends of the hames are provided at the top with rings which may serve as guides for bridle reins.

TOILET CASE.—E. P. BIDWELL, care of Bush Lane House, Cannon St., London, E. C., England. The object here is to provide a toilet case more especially designed for men's use and arranged to contain a large number of toilet articles in a comparatively small space, thus rendering the dressing case exceedingly serviceable for the use of travelers and other persons.

MOUSE TRAP.—H. PIERINI, Redleaf, Ark. This invention relates to animal traps and more particularly to an improved mouse trap. The trap has a platform adapted to tip under the weight of an animal, for precipitating the ani-



MOUSE TRAP.

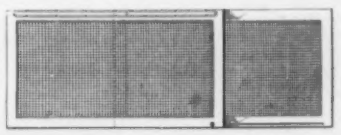
mal into a receptacle, and having means for automatically resetting the platform so that it will be always ready for use. The trap is sanitary and inexpensive to manufacture.

METHOD OF HARNESSING THE UNDERFLOW ADJACENT TO STREAMS IN SANDY STRATA.—J. H. HUNTER, 111 North 25th St., Omaha, Neb. The inventor has devised a method for obtaining clear water from the sand stratum, which is conducted off downstream, or to any point where it is available for irrigation, or power purposes, or for supplying towns or cities. It consists in digging

METHOD OF OBTAINING CLEAR WATER FROM SAND STRATUM.

a trench from a point up-stream to a point down-stream in a water-containing sand stratum, to a depth below low-water level; then laying in the trench a pipe whose upper end is closed; then excavating the sand adjacent to and around the closed upper end of the pipe, to form a reservoir of a required capacity; and finally unclosing the exposed end of the pipe.

VENTILATING SCREEN.—A. R. MOLLISON, Enderlin, N. D. This adjustable screen is for use in sleeping-rooms, hospitals, Pullman cars, and other places where the admission of fresh air, without the presence of objectionable drafts, is desired. The invention provides a



VENTILATING SCREEN.

screen including a pair of cloth or fine wire screen stretched frames, and means for securing the frames together whereby they may be adjusted to each other to fit various sized windows.

HAME.—H. C. COMBES. Address G. E. Wilson, Atty., Philadelphia, Miss. This invention is an improvement in hames, and has for its object the provision of a device of the character specified, especially adapted for use in

HAME.

plowing, but suitable for any other purpose, and especially adapted to prevent the lines from becoming tangled or caught on the hames, either with a single draft animal, or a pair or more.

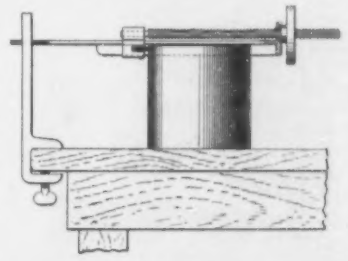
DRY PLATE CAMERA.—W. S. BENSON, 23 Delancey St., New York, N. Y. This invention relates more particularly to that variety of camera known as a dry plate camera, and has for an object to provide an improved structure wherein a picture may be taken and developed at any time without the use of a dark room.

ICE BAG CAP.—M. FINKELSTEIN, 1800 Seventh Ave., New York, N. Y. This cap is more especially designed for use on heads of persons having high fever or other ailments and arranged to securely hold the cap in position on the patient's head and without much danger of disarrangement during sleep, to allow convenient filling of the bag with ice and to drain the water from the ice bag, thus keeping the water free from the head to allow the ice to do its full share of the work.

LIFE PRESERVER.—M. A. BRAZIL, care of Amsinck & Co., 6 Hanover St., New York, N. Y. This inventor provides a device for supporting the user in an upright or standing posture; provides a floating member which will preserve its floating quality; provides a construction arranged to permit the use of offensive and defensive weapons against sharks or similar fish; and provides an apparatus adapted to be folded for storage within a minimum space.

Hardware and Tools.

CAN OPENER.—CLARA T. HARDING, care of G. C. Harding, 102 W. Market St., Blairsville, Pa. The object of this invention is to provide an improved structure wherein the opener may be operated so as to move around the can, or the can may be removed in respect to the



CAN OPENER.

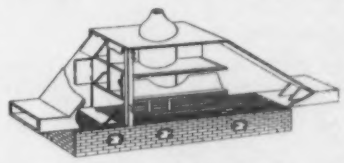
opener. Another object is to provide a guide and holding member for a can which will receive cans of various sizes and an adjustable cutting member co-acting with said guide. The opener is particularly adapted for restaurant and hotel use.

SASH FASTENER.—F. T. DAVIS, 15 South 4th Ave., Mount Vernon, N. Y. The purpose here is to provide an automatic sash fastener which is burglar-proof, and which fastener will automatically close only when the two sashes of a window are moved to the closed position, whereby injury is prevented to the window by the fastener.

GAGE AND HOLDER FOR LOCK STRIKES.—J. MACVANE, 21 Sprague St., Providence, R. I. In this case the invention has reference to gage means for use in applying a strike plate to a door jamb, and more particularly to a device having gage elements to determine the position of the strike plate on the door jamb by gaging the position of the latch bolt of the door lock.

Heating and Lighting.

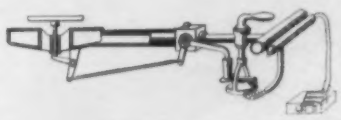
WASTE HEAT CONSERVATOR.—GUSTAV P. LUEDKE, 207 South 6th St., Springfield, Ill. This invention provides a useful gas generator for saving waste heat in smelters or plants whenever heat is lost. This generator may be also attached to another invention, devised by the inventor, for condensing noxious fumes, as in copper smelters, etc., and utilizing waste heat thereof. The hot fumes coming from the



WASTE HEAT CONSERVATOR.

smelter or furnace may be properly supplied. Charcoal, coke, or coal may be placed in the retort. By alternate blowing of superheated steam and carbon dioxide of air into the hot retort containing a hot bed of incandescent coal or coke, water gas, carbon monoxide gas, producer-gas, or coal gas, can be generated for fuel.

SAFETY GAS BURNER.—H. MENTEN, 21 Valley Place, Edgewater, N. J. This invention relates to safety economical gas burners and especially to gas burners for stoves or other devices in which gas is used for heating. It is particularly applicable to burners in which the flame is concealed from view, though it is also



SAFETY GAS BURNER.

applicable to any other type of gas burner. The primary object is to provide a gas burner of such construction that when the need for the gas flame ceases the flow of gas will be automatically cut off and a signal operated to indicate that the gas is no longer required.

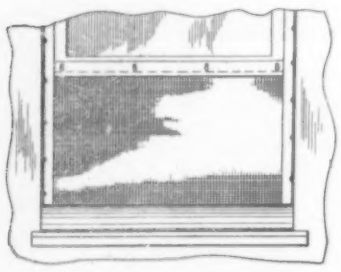
WATER PAN ATTACHMENT FOR HOT AIR FURNACES.—A. OHNEMUS. Address Excelsior Stove Mfg. Co., Quincy, Ill. This evaporating pan may be readily removed from the furnace so as to free the same from sediment

or dirt which may collect therein. The pan is in convenient position to be readily brought into view so as to fill it or to inspect its contents.

Household Utilities.

HIGH PRESSURE COOKING UTENSIL.—T. J. NASH, 235 North 22nd St., Lincoln, Neb. This invention provides a utensil with a body and a cover together, with certain arrangements and means for evenly and tightly securing the cover upon the body whereby to render the same fluid and odor tight. By these means it obtains a higher temperature and retains all of the odor, flavor and nutriment in the food and conserves the full amount of liquid within the utensil in order that it may be continuously utilized during the cooking operation.

WINDOW SCREEN.—C. H. FULDE, Cooperstown, N. Y. This invention has for its main object the provision of a screen for use either



WINDOW SCREEN.

at the top, bottom, or both, of a window, and so mounted as to be movable with a sash. A further object is to provide spring means for winding said screen upon a roller in the movement of a sash toward said roller.

FLY PAPER HOLDER.—C. M. SUCK, Salem, W. Va. The inventor provides a device for holding fly paper provided on its one face with adhesive substance for entangling the feet of the fly, wherein the holder is arranged to securely grasp the paper, and to hold it in such

FLY PAPER HOLDER.

position that it cannot be blown away, or blown against curtains or the like, to soil the same, and so arranged that the holder and the paper may be handled without the necessity of touching the paper itself.

BABY DRESSER AND WARDROBE.—CORA T. WEST, 1521 Columbus Ave., Sandusky, Ohio. The various parts of this device are arranged with reference to convenience and accessibility. The mattress is located upon the top of the wardrobe and dresser, in such position that it is readily accessible, the mattress being sunken

BABY DRESSER AND WARDROBE.

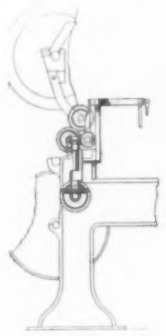
into the woodwork and so arranged as to be readily grasped by hand and removed from its mountings. The baby may be put on the dresser while it requires attention, as all articles are handy for it that are needed.

TOILET PAPER.—C. S. HUMPHREY, care of Talcum Puff Co., Bush Terminal, Brooklyn, N. Y., N. Y. The toilet paper roll is provided with openings corresponding to the seat on which the paper is to be used. In use, the roll is placed on the shaft or roller and the ends of the shaft or roller are inserted in the bearings of the arms. The free end of the strip is passed through the guide, and the paper is ready for use.

Machines and Mechanical Devices.

CHECK HOLDER.—D. C. COLE, care of Shelby State Bank, Shelby, Neb. This invention provides a device embodying two relatively movable members together with means including connections between the members whereby to cause them to automatically move against and with respect to one another when a check has been placed therebetween, and whereby to permit of the ready introduction of a check between the members by the use of one hand only.

ATTACHMENT FOR LOOMS.—E. HALL, Box 136, Kannapolis, N. C. This attachment is for looms of any character, but especially for the Crompton-Knowles terry loom, and may be applied to or detached from a loom of any character, and wherein mechanism is provided for connecting a rotating part of the loom with



ATTACHMENT FOR LOOMS.

the pile rollers for operating the said rollers during the weaving of terry or pile material, to deliver an even and uniform pile of any desired length, and said connection being operated to connect and disconnect the rotating part of the loom with the pile rollers by the pattern chain. The attachment has been used with perfect satisfaction for the last six months.

STUMP BORING MACHINE.—F. A. LONG, E. 827 Illinois Ave., Spokane, Wash. The invention relates to machines for clearing land, and more particularly to a machine especially adapted to operations upon stumps and thrown logs for the purpose of permitting effective fires to be started in the stumps and cutting the logs into sections which may be utilized to feed the stump fires.

WELL CASING DRILL.—J. O. KAFADER, Fort Bidwell, Cal. This invention improves and simplifies the construction and operation of well casing perforators of the drill type so as to be reliable and efficient in use, inexpensive to manufacture and keep in operative condition, and so designed as to be easily and quickly manipulated and positioned.

SAW BLADE HOLDER.—A. MICHIE, care of Shea & Donnelly Co., Lynn, Mass. This invention relates to stone-sawing machines and particularly to the means for holding the saw-blades on the saw-frame. With the form of blade holder ordinarily employed a disturbance of the tension of the blades is a necessary incident to the shifting of the blades in the frame.

AIR VALVE.—W. E. HEDGER, P. O. Box C, Waupun, Wis. In this case use is made of a valve stem having a longitudinal bore for inlet and outlet of air, and a valve chamber complementary to the bore. This chamber is

AIR VALVE.

enlarged at its outer end and receives a longitudinally movable valve stem carrying a valve disposed in the enlarged end of the chamber. A valve seat is provided on a bonnet being formed with a nipple to receive a dustcap or to connect with a pump. Means provide for giving the stem parallel guided movement in the chamber, and for seating the valve. The valve stem is disposed relatively to the bore of the valve body so as not to obstruct said bore, and is adapted to limit the inward movement of the valve.

LEVER LOCKING DEVICE.—J. A. DEYOUNG, 572 23rd St., West New York, N. J. This invention has a special application to a throw lever provided with a latching mechanism which is co-operative with a notched segment, the device being designed to be removably attached to the lever and to fit between the lever and the grip of the latch to hold the engaging portion of the latter in positive engagement with the notched segment.

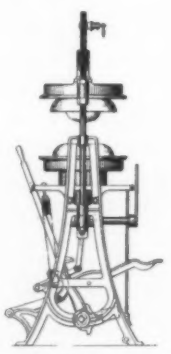
BOILER CLEANER.—J. W. SEEGRIST, care of W. L. Sayers, Hill City, Kan. This invention relates to the cleaning of boilers and removal therefrom of mud and other sedimentation of water which accumulates therein. It accomplishes this result without the necessity for drawing off all the water and cooling the boiler as by the present method, which method requires the services of two men for practically one half a day.

CUSHION POSITIVE CLUTCH.—M. BRETH, 336 E. 72nd St., New York, N. Y. The improvement provides a shiftable clutch member having driving connection with a constantly running shaft and adapted to engage another clutch element for the purpose of starting a stationary machine, means being provided to cushion the impact whereby the driving shaft, even though operated at high speed, will not cause an undesirable shock to the driven element.

AIR PUMP.—G. BRANDSTETTER, Hohenstadt, and R. FREUND, Vienna, Austria-Hungary. The invention relates to air pumps designed to furnish vacuum and air under pressure simultaneously and in which it is desired to govern the vacuum and the pressure of air independently. In this invention the desired result is obtained by a single acting pump or by a double acting pump, one and the same side of the piston of which furnishes vacuum and air under pressure.

ENVELOPE OPENER.—A. MARKS, care of the Trant & Hine Mfg. Co., New Britain, Conn. This invention provides a machine which is reliable in use and which will insure a perfect cut of the envelope at each stroke; that is to say, a cut which will be effective to open the envelope, but which will not be so long as to endanger the contents of the envelope.

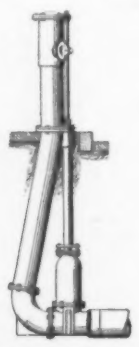
HAT PRESSING MACHINE.—J. LAKE, JR., 604 E. 17th St., Flatbush, Brooklyn, N. Y., N. Y. This invention provides means for shaping hat crowns under pressure, the pressure being applied to the crown independently of the brim; provides for contracting the crown



HAT PRESSING MACHINE.

within the desired compass and disposing the surplusage within the area usually covered by the hat band, to be in service concealed thereby; and provides means for distributing the compression area over a greater surface of the crown.

FIRE HYDRANT.—M. M. EMERSON, Gotzian Block, Pearl St., Ellensburg, Wash. The present invention has reference to fire hydrants, and provides a hydrant which is economical and highly efficient and in which no restrictions are imposed upon the free passage of liquid there-



FIRE HYDRANT.

through when the valve is open and the hydrant in use, there being no internal mechanism to occupy any portion of the area of the valve section or the standpipe in the position of the parts.

Prime Movers and Their Accessories.

INTERNAL COMBUSTION ENGINE.—H. C. WELL, 1176 Walker Ave., Bronx, N. Y., N. Y. In the present patent the invention has for its object the provision of new and improved means for rotating a valve sleeve in a cylinder, the said means consisting of a crank operable by a piston rod and geared to the sleeve.

Pertaining to Recreation.

RECREATION DEVICE.—H. SALSBURY, 11 Long Acre, London, W.C., England. This invention consists in a device comprising an aeroplane structure accommodating a number of persons and adapted to partake of movements substantially analogous to those of an actual aeroplane during flight, so that when viewing animated pictures exhibited on a horizontal screen placed some distance below the structure the passengers therein shall experience the sensation of an actual flight.

Railways and Their Accessories.

PIPE COUPLING DEVICE FOR RAILWAY AND TRAM CARS.—L. BOIRAULT, 58 Rue Taitbout, Paris, France. This invention relates to pipe coupling devices for railway and tram cars and has for its object to so construct a device of this character that it will permit of air, steam, gas, and other similar fluid pipes being brought into operative engagement with each other by simply coupling the cars together.

JACK STAND.—N. BACON, Sanford, Maine. This invention refers to a stand for supporting a jack in jacking up the journal boxes of car axles. An object is to provide a stand for the indicated purpose, having means to secure and support the same on a car wheel independently of the track bed.

Pertaining to Vehicles.

DOUBLETREE CLIP.—D. B. JACOBS, Apartment 402, 4260 Broadway, New York, N. Y. This clip is arranged to allow attachment of the clip to doubletrees of various thicknesses and widths, to permit of adjusting the clip in case of shrinkage of the wood of the doubletree, to securely hold the clip in position and to allow use of the clip at the middle of the doubletree for connection with the draw pin and hammer strap as well as on the ends of the doubletree for connection with the swingletree.

SPRING SUSPENSION FOR MOTOR CARS AND OTHER VEHICLES AND TRAVELING MACHINES.—J. A. SHEARER, Glen Osmond Road, Parkside, South Australia, Australia. This invention relates to the mounting of the frame of a vehicle upon its axles by means of levers connected with each axle and pivoted to the frame and adapted to be moved against the action of a spring or springs when the axle is raised so as to absorb the shock caused by rough roads or obstacles, and the object is to provide a construction which will prevent the transmission of shock or jar to the frame of the car, vehicle or machine.

SPRING TIRE.—J. F. HAEPPNER. Address Walter J. Smith, 1501 Gaty Ave., East St. Louis, Ill. This invention provides a spring tire, including an inner fixed rim, an outer movable rim connected to and spaced from the inner rim at a plurality of points by circular band springs, and a cover or guard plate connected to the inner rim and adapted to prevent the entrance of dust or dirt between the rims.

AUTOMOBILE SIGNAL.—E. SOULE, 339 Essex St., New York, N. Y. This inventor provides a signal box or casing adapted to be carried preferably at the rear end of the chassis or limousine, and at either side or in the center thereof, depending upon the arrangement of the steering apparatus or upon the personal preference of the owners of the machines or requirements of State or municipal ordinances.

SAFETY PRESSURE DEVICE.—W. H. WALTER, 68 W. 65th St., New York, N. Y. The invention provides a device more especially designed for use in the flexible connection connecting a pump with a pneumatic tire for inflating the latter and arranged to prevent inflation of the tire beyond a predetermined pressure, thus preventing bursting of the tire while inflating the same.

LUBRICATOR FOR LEAF SPRINGS.—P. E. ERICKSON, Port Chester, N. Y. This invention provides a lubricator for leaf springs of automobiles and other vehicles, and arranged to permit of conveniently and quickly prying the leaves apart and passing a lubricant between the opened leaves to prevent the leaf spring from squeaking and to reduce the wear thereof to a minimum.

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INQUIRIES

Inquiry No. 9423. Wanted the name and address of a concern that manufactures a product which is light in weight also pliable to the tensity of spring steel in flexibility. The material is wanted in strips varying from ¼ to ¾ of an inch in width and from 4 to 8 inches long and 3-32 to 1-16 of an inch in thickness. Vulcanized rubber would answer the purpose provided it could be made to bend.

Inquiry No. 9424. Wanted the name and address of a manufacturer who can supply paper twine and what is known as cardboard strip.

Inquiry No. 9425. Wanted the name and address of a manufacturer of supplies for model aeroplane and boat builders.

Inquiry No. 9426. Wanted the name and address of a manufacturer who can make ½" buoyant balls made into perfect spheres in large quantities. They are intended to take the place of cork. Possible wood pulp might be used.

Inquiry No. 9427. Wanted to secure patented device which is practical, not too expensive, and for which there is a real demand.

Inquiry No. 9428. Wanted to secure an interest in a manufacturing concern. Will buy part or entire interest. Must be a going concern.

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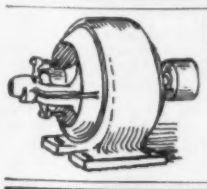

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The Government Ship Purchase Bill

(Concluded from page 177.)

cent. From Baltimore to European ports (excepting German) rates have been increased on grain 900 per cent; on flour, 364 per cent; on cotton, 614 per cent. From Norfolk to Liverpool rates on grain have been increased from 157 to 200 per cent; on cotton, 186 per cent. From Norfolk to Rotterdam the rates on cotton have been increased 471 per cent; to Bremen the rates have increased on cotton 1,100 per cent, namely, from $1.25 per bale to $15 per bale. From Savannah to Liverpool the rates have been increased on cotton 250 per cent; to Bremen the rates have been increased on cotton 900 per cent. From Galveston to Liverpool the rates have been increased on grain 174 per cent; on cotton, 361 per cent; to Bremen the rates have been increased on cotton 1,061 to 1,150 per cent.

Control of Rate Situation by Steamship Interests.

Ocean freight rates are still rising and are limited only by the greed of the steamship owners, on the one hand, and by what the traffic can stand, on the other. The Government has no power to control or regulate ocean freight rates; it cannot, under existing law, protect our foreign trade against these extortionate and hurtful charges. The steamship owners can increase rates without notice upon the instant, and our business men are helpless. The steamship companies are their own masters and they do as they please with the transportation of our exports. As already shown, they are seriously checking our foreign trade, and in some cases, such as lumber and coal, are stopping it altogether.

It may be that we cannot buy any ships. If so, great is the pity. The situation is exasperating and demands a heroic remedy. The shipping combine who are so deeply concerned lest our Government would involve us in serious complications with the belligerents, if we would buy some of the interned ships belonging to the subjects of Germany, should contain themselves in patience. The President of the United States, under whose supervision this law will be administered, may be trusted to have a greater regard for the public welfare than they have shown and to observe in letter and spirit our duties as a neutral; at the same time he will demand that the belligerents shall recognize our rights as such.

One thing is certain, the present situation has demonstrated our absolute need of an American merchant marine, not only to extend and protect our commerce in the oversens trade, but as an arm of the national defense. It is to be hoped that this lesson will not go unheeded and that selfish interests may give way to the general welfare. The plan proposed may not be the best that could be devised, but it is worthy of the consideration of all thoughtful and patriotic American citizens.

As yet no better plan has been proposed.

Some Trade-Mark Decisions.—Assistant Commissioner Newton in *ex parte* Conrad Seipp Brewing Company has held that the word "Hollander" as applied to beer is geographical and therefore not registrable. In *ex parte* the Yale & Towne Manufacturing Company he has held that the word "Yale" is registrable as a trademark under the ten year proviso of the Trade-Mark Act. In doing so Assistant Commissioner Newton said, "From the exhibits filed in this case it appears that the applicant's mark 'Yale' has been the subject of litigation in many suits and has been repeatedly upheld as a valid mark Applicant has furthermore registered the mark in the principal foreign countries, has vigorously asserted its rights to the mark against infringers, and it is now an exceedingly valuable mark." He also said, "It would seem to be an absurd and silly distinction to hold that Congress should have provided for the registration of the name of an individual which has been in use for ten years and not provided for the registration of the name of a corporation which had been used in good faith for ten years."

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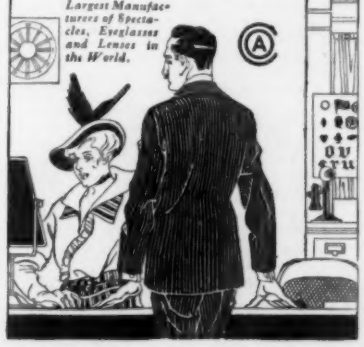

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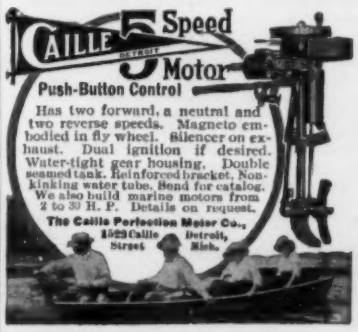

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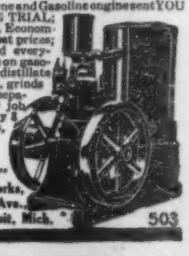

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Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(13037) C. L. J. asks: In argument with a party a short while ago, he maintained that there are three magnetic poles in the earth, one in the north polar regions, one in the south polar ditto, and one in the Sahara Desert. I have never heard of all these, in fact, was sure only of the northern one. Will you please state the facts through the SCIENTIFIC AMERICAN? A. The north magnetic pole of the earth was visited in 1831 by Sir J. C. Ross, who located it in latitude 70 deg. 5 min. N. and longitude 96 deg. 46 min. W. It was again visited in 1903 by Amundsen, who located it in latitude 70 deg. N. and longitude 96 deg. 47 min. W. The south magnetic pole was located by Lieut. Shackleton's party in January, 1909. It was then in latitude 72 deg. 25 min. S. and longitude 155 deg. 16 min. E. In 1901-1904 Capt. Scott located it in latitude 72 deg. 50 min. S. and longitude 153 deg. 45 min. E. Neither of these poles is motionless in the earth. It is not likely that there is a third pole. In Siberia there is a closed oval curve along which there is no magnetic variation, but its center does not constitute a magnetic pole.

(13038) T. A. asks: I am using a quadrant electrometer, and to charge it I use an ordinary water battery, whose use I find to be particularly troublesome, especially when the instrument is kept revolving for a long time. Could I manage to use the ordinary electric current provided for our house supply? This current is alternating, voltage 100, and cycles 60? If so, what alterations are required for the purpose? If this current won't do, what would you recommend me to use? A. A water battery is commonly employed for charging a quadrant electrometer. An alternating current cannot be employed for this work, since one pair of quadrants must be charged positively and the other charged negatively. The alternating current has no positive and negative poles. In your case the poles are reversed 120 times a second. It cannot charge a conductor nor can it produce decomposition. Nor are the commercial direct currents sufficiently constant for any exact use of them, such as your work requires. Your water battery should not be kept in connection with the quadrants long enough for it to polarize. It will then remain active for a long time.

(13039) J. B. R. asks: 1. Can a current of electricity from a storage battery or otherwise be sent into the human body and so envelop the nervous system, and carry while the person affected travels a considerable distance? A. We know of no way in which a current of electricity can be sent into a person and remain there. A condenser can be charged, and later discharged, but it is not current which is condensed. It is potential which is raised by the condenser. Current, amperes, cannot flow into a conductor and remain there ready to flow out, as water can be poured into a jug and afterward be emptied out again. If current flows it must flow around from a positive electrode to a negative electrode again, that is, from a place of higher potential to a place of lower potential. 2. Can a telephone instrument be applied at the battery end, so that you may talk along the line to the person at a distance? A. We do not know any way in which a telephone could be attached to a human body to talk to the person by means of a charge of electricity which the person is carrying around. If anything was to come of such propositions made in 1906, eight years ago, it would before this have materialized.

(13040) X. asks: Will you kindly explain a periscope as used on submarines and a water telescope? A. The periscope is an instrument enabling one under water to see over the surface of the water above. It is used on submarines, and by its assistance the submarine is directed, and its torpedoes sent to their mark. The problem of seeing to any distance below the surface has not been solved so far as disclosed. A crude instrument called a water telescope has been employed for looking down into the water. It acts simply by preventing the ripples on the surface caused by the wind, which are the chief obstacles to a clear view in clear water. In muddy water, of course, there cannot be a view of the bottom by any means whatever. The water telescope consists of a box three or four feet long and six inches square, large enough so that both eyes can be used to look into it. One end is open and in the other a piece of plate glass is set water tight. The glass end is thrust down into the water and the observer looks down through the glass. This does not magnify at all, but it does render the surface of the water under the glass entirely smooth, and thus the light rays are not disturbed by the roughness of the surface of the water, as is usually the case. Almost all the time there are minute ripples going over the surface of the water, and the larger waves prevent seeing to a greater extent than do the ripples. The water telescope, which any one can make, will increase the power of vision below the surface very greatly. The inside of the box must be painted a dull black. You will find the periscope illustrated and described in our War Issue, No. 2, price 25 cents.

NEW BOOKS, ETC.

CYCLOPEDIA OF AMERICAN GOVERNMENT. Edited by Andrew C. McLaughlin and Albert Bushnell Hart. New York: D. Appleton & Co., 1914. Large 8vo.; 732 pp.

The need of a Cyclopedia of American Government has been made plain to the editors of this work by their own experience as students and teachers; they have often found trouble in readily obtaining brief and specific discussions of many aspects of the field. New political methods, new phrases, new facts and principles of social activity, as well as new governmental forms, are constantly coming into existence, and of many of these it is impossible to find mention in the ordinary handbook. The literature of the subject is large, but there is not in any convenient form a systematic and fairly comprehensive treatise of the whole field. The large general cyclopedias, though containing articles of considerable length, have little to say about the details of government and almost nothing about governmental practices, or the activities of what might be called unwritten and extra-legal government. The editors are confident that this work will in considerable measure supply the need for a usable, succinct and comprehensive presentation of practical, actual and theoretical government in America. The subject has been treated in a very large way, and the present volume takes us down part way through the letter F. It should be found in every library.

THE AMERICA'S CUP RACES. By Herbert L. Stone, Editor of Yachting. New York: Outing Publishing Company. 48 illustrations. 327 pp., 5½ x 8.

So full of incidents and detail is the history of the "America's" cup, that to write an adequate book on this subject within a reasonable compass calls for no little discrimination and patience. The work before us contains all the essential facts of this long struggle for the premier yachting trophy of the world; at the same time it is enriched with the essential human element which makes the story decidedly fascinating, not merely to the technically instructed yachtsman, but to the average lay reader. The author has both the technical and literary qualifications for the task, and the work has been exceedingly well done. A feature which will be appreciated is the reproduction of the sheer plan, midship section, and deck plan of all the challenging and cup-defending yachts up to the time of the "Valkyrie"-"Defender" races. Unfortunately in the plans, this history of the cup, like others which have preceded it, stops at this point; probably for the reason that the designers of the yachts covering the Lipton period of challenges have been unwilling to make public such details. Another illustrated feature which will be greatly appreciated is the series of half-tones in sepia tint with which the volume is enriched. The plates measure four by five and one half inches, and they form in themselves a handsome and illuminating collection of views, many of which are new to us. The work opens with a description of the formation and early days and best known members of the New York Yacht Club, particularly those who were interested in the original "America." The "America's" race around the Isle of Wight, in which she won her cup, is described; and thereafter the successive challenges and the deciding races of each series. Two pages of the work give, in tabulated form, the sailing lengths, the courses, the time allowed, the elapsed and the winning time for every one of the races sailed for the "America" cup.

THE TRAINING OF A FORESTER. By Gifford Pinchot, with 8 illustrations. Philadelphia and London: J. B. Lippincott Company, 1914. Size 5 x 7½ 157 pp. Price, $1 net.

The name of the author of this useful and decidedly interesting volume is a guarantee that its contents are illuminating on the subject treated of, for Mr. Pinchot for several years was the Chief Forester of the United States. In his preface the author says: "To the young man who is attracted to forestry, and begins to consider it a possible profession, certain questions present themselves. What is forestry? If he takes it up, what will his work be, and where? Does it, in fact, offer the satisfying type of outdoor life which it appears to offer? What chance does it present for a successful career, for a career of general usefulness, and what is the chance to make a living? Is he fitted for it in character, mind and body? If so, what training does he need? To answer these questions, Mr. Pinchot has drawn from his extensive knowledge and embodied the material in the volume before us. The work is illustrated with some excellent halftone engravings, full of the atmosphere of the forester's life, and we take it that the work will not only prove very useful to the young man who is thinking of taking up forestry, but it will be decidedly attractive to the average layman who loves the forests and the hills.

FAMILY EXPENSE ACCOUNT. By T. A. Brookman. Cloth. Boston: D. C. Heath & Co., 1914. 112 pp. Price, 60 cents.

Through the somewhat novel and ingenious plan of tracing the financial history of a newly married couple for a series of years, pupils are taught the value of money, how to keep household accounts, the necessity of planning in order to make their income meet the necessities and at the same time leave any sum of permanent saving. Arithmetic, domestic economy, household accounting, the writing of checks and other business papers, the placing of insurance, etc., are made very real. While learning these matters, young people are also taught certain of the fundamental facts of economic and social life. The book is to be commended because of the service it will render society, and it is to be hoped that many schools will find a place for it.

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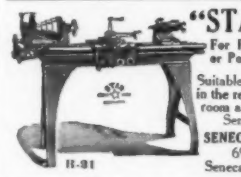

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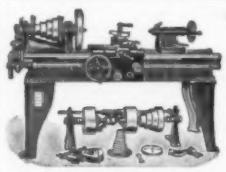

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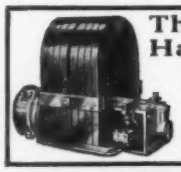

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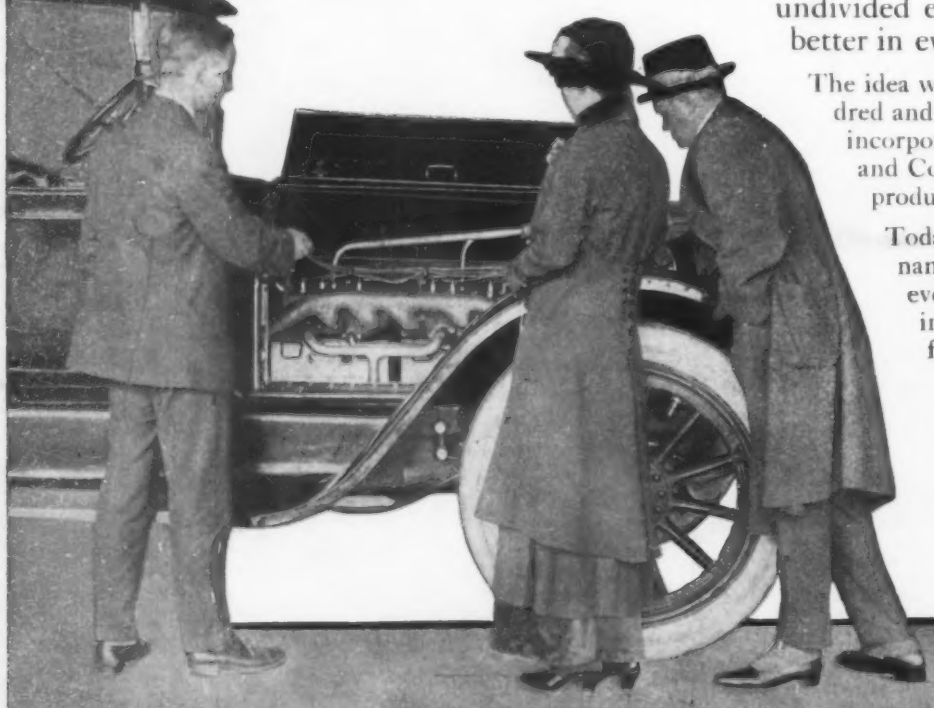

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